



CME 425 Heat and Mass Transfer

Spring 2014

University of Kentucky College of Engineering, Paducah

Lecture: 9:30AM-10:45AM TR CLC 220

Course Web Page: <http://www.engr.uky.edu/~silverdl/CME425/>

INSTRUCTOR:	Dr. David L. Silverstein	
	205 Crouse Hall (270) 534-3132 (Office) SilverDL@engr.uky.edu	Office Hours: Open door policy-- when I am there, I am usually available. To guarantee availability, make an appointment.
CATALOG COURSE SUMMARY:	This course will explore fundamental principles of conduction and convective heat transfer, and present concepts of diffusional and convective mass transfer. Design applications to heat exchangers and packed bed absorbers will be explored. Prereq: CME 320, ME 330, engineering standing.	
TEXT:	Welty, Rorrer, and Foster, <i>Fundamentals of Momentum, Heat and Mass Transfer, 6th Edition</i> , John Wiley and Sons (2015).	
COURSE OBJECTIVES:	This course is designed to introduce students to the basic concepts of linear systems modeling and control.	
COURSE EXPECTATIONS:	<p>At the conclusion of this course, you should be able to:</p> <ol style="list-style-type: none"> 1. Solve problems requiring a comprehensive understanding of forced and convective heat transfer, and of heat transfer accompanying phase change. 2. Solve rate oriented problems associated with gas, liquid, and solid diffusive and gas and liquid forced convective mass transfer; and simultaneous heat and mass transfer. 3. Design heat exchangers, condensers, boilers, conductors, and insulations for specific applications. 4. Size and predict pressure drops of packed columns for use as absorbers and strippers, for humidification operations, and for extraction. 5. Understand the principles of mass transfer controlled chemical reactions in various regimes. 6. Use computer software and programming languages to solve heat and mass transfer related problems. 	
COURSE POLICIES:	<p>Attendance is required at all lectures. Unannounced quizzes on reading or lecture material will be administered during classes. Bring your calculators to all classes. Calculators with communication or text storage capability are not permitted on exams. Homework assignments will be distributed in class. Use of tobacco products are not permitted in UK classrooms. Cell phones must be silenced and stowed during class.</p> <p>Homework is due within the first five minutes of the scheduled start of the period for which it is assigned. Late homework will receive no credit.</p> <p>Handwritten homework must be submitted on 8.5"x11" green engineering paper (except for computer printouts), one side per page. All pages should be numbered and contain your name. Multiple pages should be secured by paper clip and not folded or stapled. Individual solutions should stand alone-- no reference to the source of the original problem should be required to understand the context and meaning of the solution you present. Each solution should contain a problem statement, a list of assumptions, a diagram (if appropriate), and a solution containing adequate steps and explanations to ensure understanding of your solution by the instructor. The final solutions to a homework problem must be boxed or otherwise distinguished from the remainder of the problem.</p> <p>Problems solved using a computer must contain all information required to reproduce your solution. Among other things, this means a spreadsheet printout only containing numbers is not sufficient. The formulas used must be included on the printout. All numbers must be identified and labeled with appropriate units. You must submit the data file electronically along with a printout for problems solved with computers. Specific guidelines for completing programming problems will be provided with the first programming assignment.</p> <p>Homework assignments are individual tasks. No copying of solutions is permitted. You are, however, encouraged to work in small groups to discuss methods of solving the homework problems. Bear in mind that setting problems up is the most difficult part of most problems, and failure to practice setting problems up independently will likely result in an inability to set problems up on exams. You must indicate whom you work with on assignments completed with assistance</p>	

	<p>from a group. Certain assignments may be designated group problems and must be solved as a group. Details on group problems will be provided when assigned.</p> <p>Any disputes regarding grading must be resolved within 5 school days of the original issuance of the grade. Requests to re-grade a problem may result in the entire assignment being re-graded and adjustments to all scores being made. This can potentially result in a decrease of score. Any grades not challenged within the five school day period are considered final. This applies to both homework and exams.</p> <p>Cheating is strictly forbidden, and anyone found doing so will be turned over to the University Registrar and dealt with in accordance with University policy. Working together on homework is encouraged, but each person must independently write-up their own work and cite any assistance they have had from classmates. Copying homework (problems, graphs, figures, computer files, etc.) between individuals is considered cheating.</p>								
GRADING:	<table> <tr> <td>Final Exam:</td> <td>25%</td> </tr> <tr> <td>Hour Exams:</td> <td>50%</td> </tr> <tr> <td>Homework Assignments /Quizzes</td> <td>10%</td> </tr> <tr> <td>Lab Reports/Projects</td> <td>15%</td> </tr> </table> <p>A weighted grade of 90 or above is guaranteed an A, 80 or above at least a B, 70 or above at least a C, and 60 or above at least a D. A grade of E will be assigned to anyone earning a weighted grade below 60.</p> <p>For grades near the endpoints in the above distribution, consideration will be given to homework performance, class participation, and performance trends as a function of time.</p> <p>Homework and exam problems will be graded based on the following factors: correct assumptions, correct diagrams, legibility, clarity, neatness, identification of paper, clearly defined answer, correct approach to problem, and the correct answer. These criteria will be weighted according to the instructor's judgment for a particular problem. These criteria will be weighted according to the instructor's judgment for a particular problem. Satisfactory completion of homework may be required to pass the course.</p> <p>Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (http://www.uky.edu/Registrar/AcademicCalendar.htm)</p>	Final Exam:	25%	Hour Exams:	50%	Homework Assignments /Quizzes	10%	Lab Reports/Projects	15%
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HOMEWORK:	Approximately 12 assignments will be given. Some homework assignments will require use of a computer software package. Unless otherwise specified, any suitable software package may be used to complete your homework (Maple, Mathcad, Matlab, C/C++, FORTRAN, Visual BASIC, spreadsheet).								
FIRE SAFETY:	In the event of a fire, all students, faculty and staff should leave the building through the nearest exit and gather in the parking lot in front of Crouse Hall. A fire alarm should be treated as indicative of an actual fire.								
INCLEMENT WEATHER:	WKCTC inclement weather policy will be followed for this class. If start of classes is delayed due to inclement weather, this class will start at 11AM.								
EXAMINATIONS:	<p>There will be three in-class examinations and a final examination. The in-class exams will be cumulative since the previous exam. Hour exams will be closed book, closed notes, unless otherwise specified. No make-up hour exams will be given except with the advance consent of the instructor. The final exam will be comprehensive. There will be no make-up final exam.</p> <p>Exam dates are February 12, 2014; March 12, 2014; and April 23, 2014. These dates may be changed by mutual consent with at least one week warning. The Final Exam will last 2 hours and will begin at 8:00AM on Wednesday, May 7, 2014. The date for this exam is scheduled administratively and cannot be changed.</p>								
EXCUSED ABSENCES:	<p>Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.</p> <p>Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Information regarding dates of major religious holidays may be obtained through the religious liaison, Mr. Jake Karnes (859-257-2754).</p>								

	<p>Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.</p> <p>Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request “appropriate verification” when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.</p>
<p>ACADEMIC INTEGRITY:</p>	<p>Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.</p> <p>Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: http://www.uky.edu/Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.</p> <p>Part II of Student Rights and Responsibilities (available online http://www.uky.edu/StudentAffairs/Code/part2.html) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.</p> <p>When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else’s work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.</p> <p>Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student’s assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).</p> <p>Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.</p>
<p>ACCOMODATIONS DUE TO DISABILITY:</p>	<p>If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, (859) 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities. See Denise Brazzell for more information.</p>

Course Schedule

Period	Date	Reading Assignment	Problems Due
Lecture	01/13	Review Chapters 4,6	
Recitation	01/14	Chapter 15, pp. 221-233	
Lecture	01/15	Chapter 16, pp. 236-244	
Holiday	01/20		Problem Set #1
Recitation	01/21	Chapter 17, pp. 247-256	
Lecture	01/22	Chapter 17, pp. 256-263	
Lecture	01/27	Chapter 17, pp. 263-269	Problem Set #2
Recitation	01/28		
Lecture	01/29	Chapter 18, pp. 277-286	
Lecture	02/03	Chapter 18, pp. 286-296	Problem Set #3
Recitation	02/04		
Lecture	02/05		
Lecture	02/10	Chapter 19, pp. 301-321	Problem Set #4
Recitation	02/11		
EXAM	02/12	Exam I	
Holiday	02/17	Chapter 20, pp. 324-338	Problem Set #5
Recitation	02/18		
Lecture	02/19	Chapter 20, pp. 338-346	
Lecture	02/24	Chapter 21, pp. 352-363	Problem Set #6
Recitation	02/25		
Lecture	02/26	Chapter 22, pp. 365-385	
Lecture	03/03		Problem Set #7
Recitation	03/04		
Lecture	03/05	Chapter 23, pp. 390-426	
Lecture	03/10		Problem Set #8
Recitation	03/11		
EXAM	03/12	Exam 2	
Holiday	03/17		
Holiday	03/18		
Holiday	03/19		Project 1 Due
Lecture	03/24	Chapter 24, pp. 431-462	
Recitation	03/25		
Lecture	03/26	Chapter 25, pp. 467-484	Problem Set #9
Lecture	03/31	Chapter 26, pp. 489-510	
Recitation	04/01		
Lecture	04/02	Chapter 26, pp. 510-520	Problem Set #10
Lecture	04/07	Chapter 27, pp. 533-550	
Recitation	04/08		
Lecture	04/09	Chapter 28, pp. 556-564	Problem Set #11
Lecture	04/14	Chapter 28, pp. 564-586	
Recitation	04/15		
Lecture	04/16	Chapter 29, pp. 592-610	Problem Set #12
Lecture	04/21	Chapter 30, pp. 617-644	
Recitation	04/22		
EXAM	04/23	Exam 3	
Lecture	04/28	Chapter 31, pp. 655-686	
Recitation	04/29		Problem Set #13
Lecture	04/30		Project 2 Due
EXAM	05/07	Comprehensive Final Exam	

All material on this schedule is subject to change at instructor's discretion for pedagogical reasons. Page numbers are based on the 6th edition of the text and will vary somewhat for previous editions.