Spring 2015 - CENG315: Transport Phenomena

Professor Chinedum Osuji
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Description Treatment of momentum, energy, and chemical species transport including conservation laws, flux relations, and boundary conditions. Focus is mostly on energy and chemical species transport for audiences that have already taken fluid mechanics (eg. MENG361a). Topics include convective and diffusive transport and interfacial transport phenomena. Emphasis on problem analysis and mathematical modeling, including problem formulation, scaling arguments, analytical methods, approximation techniques, and numerical solutions.

TA Name: Yekaterina Rokhlenko, Office: ML222, Email: yekaterina.rokhlenko@yale.edu.
Office hours - TBA

Prerequisite ENAS 194 (Partial Differential Equations) or instructor's permission

Class Mondays and Wednesdays, 1:00p-2:15p, HLH17 113

Office Hours Tuesdays and Thursdays, 12:00p-1:00p or TBD

Textbook "Fundamentals of Momentum Heat and Mass Transfer" 5^{th} ed. by J. R. Welty, C. E. Wicks, R. E. Wilson and G. Rorrer

Exams There will be two preliminary exams during the semester and a final exam at the end. Prelims will be in the lecture room at HLH17 113 with dates as noted on the schedule. The final is currently scheduled for 09:00 on W 05/06/2015.

Homework There will be periodic homework assignments throughout the semester (≈6-8) which should be submitted at the start of class on their due date. Students are permitted to work cooperatively on assignments, but *each person must submit his or her own individually prepared results.*

Grading

Quizzes and in-class discussions	50 points
Exam I	200 points
Exam II	200 points
Final Exam	200 points
Graded Homework	350 points
Total	1000 points

Letter grades will be assigned according to the scale below

850 points	A- or better
700 points	B- or better
450 points	C- or better

Lecture #	Date	Lecture Topic	Chapter(s)
1	M Jan 12	Introduction, review of fluid mechanics	3,4,5,6
2	W Jan 14	Fundamental transport equations and control volumes	4,5,6
3	F Jan 16	Conduction - rate equation	15
	M Jan 19	*No class - MLK*	
4	W Jan 21	Conduction - Heat Diffusion; Boundaries	15,16
5	M Jan 26	One-dimensional conduction	16,17
6	W Jan 28	One-dimensional conduction	17
7	M Feb 02	Two-dimensional conduction	17
8	W Feb 04	Transient conduction	18
9	M Feb 09	Transient conduction	18
	W Feb 11	*Exam I*	
10	M Feb 16	Convective heat transfer	19,20
11	W Feb 18	Convective heat transfer	19,20
12	M Feb 23	Forced and free heat convection	19,20
13	W Feb 25	Forced and free heat convection	19,20
	M Mar 02	*No class*	
	W Mar 04	*No class*	
	M Mar 09	*Spring recess*	
	W Mar 11	*Spring recess*	
	M Mar 16	*Spring recess*	
	W Mar 18	*Spring recess*	
14	M Mar 23	Convective mass transfer	28
15	W Mar 25	Convective mass transfer	28
16	M Mar 30	Diffusive mass transfer - Fundamentals	24,25
17	W Apr 01	Diffusive mass transfer - Steady state (1D,2D)	25,26
18	M Apr 06	Diffusive mass transfer - Steady state (1D,2D)	25,26
	W Apr 08	*Exam II*	
19	M Apr 13	Diffusive mass transfer - Transient	27
	W Apr 15	*No class*	
20	M Apr 20	Diffusive mass transfer - Transient	27
21	W Apr 22	Inter-phase convective mass transfer	29
	W May 06	**Final Exam**	