The University of Texas at Dallas – Course Syllabus

MECH 6374 – Conductive and Radiative Heat Transfer

Department of Mechanical Engineering

Course Information:

Course Number/Section	MECH6374.001
Course Title	Conductive and radiative Heat Transfer
Term	Fall 2016
Days & Times	Tuesday & Thursday: 2:30 - 3:45 am
Meeting Place	ECSN 2.112

Professor Contact Information: Prof. Zhenpeng Qin

Office Phone	972-883-4440
Office Location	ECSN 2.214
Office Hours	Tuesday: 1:00 - 2:00 pm

Teaching Assistant:	Ms. Niloofar Mohammadi
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Office Location	ECSN 2.232
Office Hours	Monday 11:30-12:30

Course Description:

Advanced conduction heat transfer followed by advanced radiation heat transfer. Emphasis on fundamental concepts of conduction/diffusion in heat and mass transfer including solving differential equations related to conduction. Radiation heat transfer covering black and non-black surfaces, shape factors, radiation exchange in gray diffuse enclosures, and solution methods for integro-differential equations. Multi-mode heat transfer combining conduction and radiation and recent developments in nanoscale conduction and radiative are also covered.

Textbook and References:

- D.W. Kahn, M.N. Ozisik, Heat Conduction, 3rd Ed. (**required text,** available online through university library)
- M.F. Modest, Radiative Heat Transfer, 3nd Ed. (**required text**, available online through university library)
- V.S. Arpaci, Conduction Heat Transfer.
- R. Siegel, J.R. Howell, Thermal Radiation Heat Transfer, 5th Ed.

Student Learning Objectives/Outcomes

- Ability to analyze and formulate heat conduction problems (governing equation with boundary and initial conditions), and analytically solve 1D transient and 2D steady state problems.
- Ability to solve heat conduction problems with Laplace transform and Green's function approach with references
- Ability to analyze and formulate radiative heat transfer problems (governing equation with boundary conditions)

Grading & Course Policies:

- Grades will be determined based on a fixed point scale and a weighted average of homework and exams.
- Home assignments: **30%** - Credit will be given only if the problems are turned in on time. Homework is due before class starts on the due date (2:30pm sharp). Late homework will NOT be acceptable.

- Projects: **30%** - Student will work in groups (3 students per group) to propose a project related to radiation and conduction heat transfer. A final report and presentation are required. For the report, student need to draft a proposal detailing the background, innovation, and proposed approach (4 pages) and a technique portion which details the analysis and simulation that supports the proposed project (6 pages). Grading will be evaluated based on student's report and presentation.
- Examinations: **30%** - Make-up exams will be only available by Professor's permission in advance.
- Class attendance: **10%** - Students are expected to attend all class sessions and participate in class discussions. If a student misses a class, it is his/her responsibility to make up the missed class. It is at the Professor's discretion to determine the class attendance through various measures.
- Final grade: A: 93~100, A-: 90~92; B+: 87-89; B: 83~86; B-: 80-82; C: 70-79; F: <70.

Tentative schedule & topics as of Aug. 22nd 2016: Changes will be announced in the class through the semester.

Wk	Date	Topic	Homework (HW)
Radiative Heat Transfer			
1	08/23	Fundamentals	
1	08/25	Surface properties - Geometry	
2	08/30	Surface Properties	HW#1
2	09/01	Surface Properties	
3	09/06	View factor	
3	09/08	Radiative exchange between surfaces	HW#1 due
4	09/13	Radiative exchange between surfaces	HW#2
4	09/15	Monte Carlo (MC)	
5	09/20	Monte Carlo (MC)	
5	09/22	Monte Carlo (MC)	HW#2 due
6	09/27	**Project progress and discussions**	HW3
6	09/29	Radiation + Conduction + Convection – Ch7	
7	10/04	Radiative transfer equation (RTE) – Ch10, intro	
7	10/06	RTE	HW3 due
8	10/11	Particular media	
Conductive Heat Transfer			
8	10/13	Introduction, Separation of variables (SOV)	
9	10/18	SOV	HW#4
9	10/20	SOV	
10	10/25	SOV	HW#4 due
10	10/27	SOV – Superposition	
11	11/01	SOV – Superposition	HW#5
11	11/03	Cylindrical system SOV	
12	11/08	Cylindrical system SOV	
12	11/10	Laplace transform	HW#5 due
13	11/15	Laplace transform	
13	11/17	**Project report and presentations**	HW#6
14	11/22	No classes	
14	11/24	No classes	
15	11/29	Intro to Green's Function	
15	12/01	Determine Green's function	HW#6 due
16	12/06	Review	
	Final Exam	Scheduled by the University, **student needs to reserve a seat online!**	

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.