# The University of Texas at Dallas – Course Syllabus

# MECH 6374 – Conductive and Radiative Heat Transfer Department of Mechanical Engineering

### **Course Information:**

Course Number/Section	MECH6374.0U1
Course Title	Conductive and radiative Heat Transfer
Term	Summer 2016
Days & Times	Monday & Wednesday: 12:30pm-2:45pm
Meeting Place	ECSN 2.120

Professor Contact Information: Prof. Hui Ouyang				
Email	hxo150330@utdallas.edu			
Office Location	ECSN 3.214			
Office Hours	By appointment			
Teaching Assistant:	Joshua Salazar			
Email	jxs123930@utdallas.edu			
Office Location	ECSN 3.124			
Office Hours	Mon&Wed 2:45-3:45			

### **Course Description:**

Advanced radiation heat transfer followed by advanced conduction 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, <u>available online</u> through university library)
- R. Siegel, J.R. Howell, Thermal Radiation Heat Transfer, 5<sup>th</sup> Ed. (<u>available online</u> through university library)
- V.S. Arpaci, Conduction Heat Transfer.
- M.F. Modest, Radiative Heat Transfer, 3<sup>nd</sup> Ed. (acceptable as an alternative, <u>available online</u> through university library)

## **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 weight average of homework and exams.
- Home assignments: **20%** Credit will be given only if the problems are turned in on time. Homework is due before class starts on the due date (12:30pm sharp). Late homework will NOT be acceptable.
- Class participation: **10%** Students are required 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.
- Small Projects: 15%
- Exam: Mid-term **20%** and Final exam **35%** Make-up exams will be only available by Professor's permission <u>in advance</u>.

Tentative schedule & topics as of May. 23<sup>th</sup> 2016: Changes will be announced in the class through the semester.

Wk	# lectures	Date	Торіс	Homework (HW)	Textbook
1	1	05/23	Fundamentals		
1	2	05/25	Fundamentals		
2		05/30	Memorial day – University closed		
2	3	06/01	Surface properties	<mark>Project 1 Due</mark> – Paper 1 discussion	
2	4	06/06	Surface properties		
3	5	06/08	View factor	HW#1 DUE – Paper 2 discussion	
3	6	06/13	View factor	Project 2 Due	
4	7	06/15	Radiative exchange between surfaces	Paper 3 - discussion	
4	8	06/20	Radiative exchange between surfaces		
4	9	06/22	Radiative exchange between surfaces	Project 3 Due	
5	10	06/27	Radiative transfer equation (RTE) – Ch10, intro	HW#2 DUE	
5		06/29	Midterm exam		
5		07/04	July 4 <sup>th</sup> – University closed		
6	11	07/06	Introduction		
6	12	07/11	Orthogonal Function		
7	13	07/13	SOV	Paper 4 - discussion	
7	14	07/18	SOV		
8	15	07/20	SOV - Superposition	HW#3 DUE	
8	16	07/25	Cylindrical system SOV		
8	17	07/27	Laplace Transform	Paper 5 - discussion	
9	18	08/01	Laplace Transform		
9	19	08/03	Green Function		
10	20	08/08	Green Function	HW#4 DUE	
10		TBD	Final Exam		

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year. The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Series 50000, Board of Regents, The University of Texas System,* and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures.* Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391). A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey

federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

#### Academic Integrity:

The faculty expects from its students a high level of responsibility and academic honesty.

Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

#### Email Use:

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

### Withdrawal from Class:

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

#### **Student Grievance Procedures:**

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's Handbook of *Operating Procedures*. In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

#### Incomplete Grade Policy:

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.

### **Disability Services:**

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their nondisabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m. The contact information for the Office of Disability Services is:

The University of Texas at Dallas, SU 22

PO Box 830688

Richardson, Texas 75083-0688

(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

#### **Religious Holy Days:**

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment. If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.