# Advanced Heat Transfer

(Offered at fall 2021)

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**Course Description**: This course is designed to develop skills for formulating complex conduction heat transfer problems and introduce various analytical methods available for solving the conduction heat transfer problems. A review of some topics related to convection heat transfer and radiation might be covered.

## <u>Course Outline:</u> Introduction, Basic Concepts Problem Formulations

- Lumped, Integral and Differential Formulation of General Laws
- Particular laws
- Equation of Conduction
- Initial and Boundary Condition
- Methods of Formulation

# 1-D, Steady State Heat Conduction

- Composite Media
- Extended Surfaces
- Power Series Solution, Bessel Functions

## 2-D/3-D Steady State Heat Conduction Problems

- Boundary-value Problem
- Orthogonality of Characteristic Functions
- Separation of Variables
- Nonhomogeneity

### **Unsteady State Heat Conduction Problems**

- Lumped heat transfer problems
- Combination of Variable
- Laplace Transforms

### **Convection Heat Transfer**

- The equation of Continuity, Motion and Energy
- Laminar Boundary layer
- Thermal Boundary Layer

#### **Radiation Heat Transfer**

### **References:**

Arpaci, V.S., *Conduction Heat Transfer*, Addison-Wesley (1966). Ozisik, M.N., *Heat Conduction*, John Wiley (1984). Carslaw, H.S. and J.C. Jaeger, *Conduction of Heat in Solids*, Oxford University Press (1959).

#### Grading:

Mid Exam = 6 points (Date: 1400/10/08) Final Exam = 12points H. W. Assignments and Participation in Class Discussions= 3 points

### **General Rules:**

Attendance at lectures is essential. So, absences more than 3/16 of the total sessions automatically cause to lose the course. Exams will be close book.