

# Advanced Heat Transfer

(Offered at fall 2021)

**Instructor:** M. Khamforoush (e-mail: m.khamforoush@uok.ac.ir)

**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.

## Course Outline:

### **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.