

THE DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

AA 419 AEROSPACE HEAT TRANSFER

WINTER QUARTER

CREDITS AND

CONTACT HOURS: 3 Credits, Three 50-minute lectures per week.

COORDINATOR: Dana Dabiri, Associate Professor of Aeronautics and Astronautics

TEXTBOOK: Fundamentals of Heat and Mass Transfer, Bergman, Lavin, Incropera and DeWitt, Seventh Edition, Wiley, 2011.

SUPPLEMENTAL MATERIALS:

None

CATALOG DATA: AEROSPACE HEAT TRANSFER, Selective Elective
Fundamentals of conductive, convective, and radiative heat transfer with emphasis on applications to atmospheric and space flight.
Prerequisite: PHYS 123; MATH 307; MATH 324. Offered: W.

PREREQUISITES BY TOPIC:

- 1) Senior status
- 2) Thermodynamics
- 3) Gasdynamics

OUTCOMES:

- 1) Students will be able to derive the governing equations of heat transfer.
- 2) Students will be able to analytically and numerically solve problems of heat conduction and convection.
- 3) Students will be able to analytically solve problems of radiative heat transfer.

RELATIONSHIP TO STUDENT OUTCOMES:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- c) An ability to design a system, component, or process to meet desired needs.
- e) An ability to identify, formulate, and solve engineering problems.
- g) An ability to communicate effectively
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

TOPICS:

- 1) Physical basis and governing equations of heat transfer (2 classes)
- 2) One-dimensional, steady-state conduction (5 classes)
- 3) Transient conduction-lumped capacitance model, Biot number (3 classes)
- 4) Equations of convection; correlation coefficients, similarity analysis (4 classes)
- 5) Convective heat transfer for internal flow (2 classes)
- 6) Free convective heat transfer (2 classes)
- 7) Heat Exchangers (1 class)
- 8) Radiative transfer, Processes & Properties (4 classes)
- 9) Radiative transfer, Exchange between Surfaces (2 classes)
- 10) Radiative transfer in gases (2 classes)

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