

Instructor

Prof. Ashish Aphale
E-mail: aaphale@kennesaw.edu
Office Phone: 470-578-7835

Office Location: Q-103 B

Office Hours: T / Th:10- 11:00 am



**KENNESAW STATE
UNIVERSITY**
SOUTHERN POLYTECHNIC
COLLEGE OF ENGINEERING AND
ENGINEERING TECHNOLOGY
Department of Mechanical Engineering

Faculty Web Page: <http://facultyweb.kennesaw.edu/aaphale/>

Course Description

Catalog Description (Credit Hours: 3)

Fundamentals and applications of heat transfer including conduction, convection, and radiation. Steady state and transient conduction in one and multi dimensions. Forced and free convection with boundary layer theory. Radiation properties and radiative heat transfer among black and non-black bodies. Calculation of heat transfer rates, heating /cooling times and design of heat exchangers.

Prerequisites

ENGR 3343 (Fluid Mechanics), ME 3410 (Thermodynamics). If you do not meet the prerequisite requirements, you are expected to withdraw from this course. If it is discovered that a student is lacking in prerequisites (at any time during the semester), the instructor reserves the right to remove the student from the class and assign a grade of W (or WF if past the drop date).

If you do not meet the prerequisite requirements, you are expected to withdraw from this course. If it is discovered that a student is lacking in prerequisites (at any time during the semester), the instructor reserves the right to remove the student from the class and assign a grade of W (or WF if past the drop date).

Course Details

Semester: Fall 2022

Course name: Heat Transfer

Course number: ME 3440

Section number: 1

Meeting times: M/W 6:30 pm – 7:45 pm

Room number: Engineering Technology Center: Room 105

Course Learning Outcomes

Upon completion of this course, students should have the ability to:

1. Evaluate and explain the heat transfer mechanisms and related thermo-physical properties.
2. Determine one dimensional and multi-dimensional; steady and transient conduction heat

- transfer rates with relevant boundary and initial conditions.
3. Understand concepts of boundary layer, laminar and turbulent flows, forced and free convection to calculate or select convective heat transfer coefficients.
 4. Describe radiation properties and concepts and calculate radiative heat transfer rate among black and gray surfaces.
 5. Calculate heat transfer rates and heating/cooling times for material selection and design optimization of heat transfer surfaces and systems.

Performance Indicators for Assessment of ME Program Student Outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to communicate effectively with a range of audiences
3. An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions
4. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Topics covered

Heat Conduction Equation

Steady & Transient Heat Conduction

Numerical Methods in Heat Conduction

Fundamentals of Convection

External Forced Convection

Internal Forced Convection

Natural Convection

Heat Exchangers

Fundamentals of Thermal Radiation

Radiation Heat Transfer

Textbook

Required: Cengel, Yunus A, and Ghajar J. Afshin., Heat and Mass Transfer: Fundamentals and Applications, 5th Edition, McGraw-Hill, New York, 2011

Recommended Text: J.P Holman, "Heat Transfer", tenth edition, McGraw-Hill, New York ,ISBN-10: 0073529362

Important Dates

- First day of class: Aug 15th 2022
- Add/drop date: Aug 15- 19, 2022

- Last day to withdraw: Oct 11, 2022 (w/o WF)
- Last day of classes: Dec 5, 2022
- Final Exams start: Dec 6 to 12, 2022

Course Delivery

KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

COVID-19 Illness

If you are feeling ill, please stay home and contact your health professional. In addition, please email your instructor to say you are missing class due to illness. Signs of COVID-19 illness include, but are not limited to, the following:

- Cough
- Fever of 100.4 or higher
- Runny nose or new sinus congestion
- Shortness of breath or difficulty breathing
- Chills
- Sore Throat
- New loss of taste and/or smell

COVID-19 vaccines are a critical tool in “Protecting the Nest.” If you have not already, you are strongly encouraged to get vaccinated immediately to advance the health and safety of our campus community. As an enrolled KSU student, you are eligible to receive the vaccine on campus. Please call (470) 578-6644 to schedule your vaccination appointment or you may walk into one of our student health clinics.

For more information regarding COVID-19 (including testing, vaccines, extended illness procedures and accommodations), see KSU’s official [Covid-19 website](#).

Face Coverings

Based on guidance from the University System of Georgia (USG), all vaccinated and unvaccinated individuals are encouraged to wear a face covering while inside campus facilities. Unvaccinated individuals are also strongly encouraged to continue to socially distance while inside campus facilities, when possible.

Technical Requirements

Access to D2L is essential for the course material and instructions.

Grading Policy

Homework	20%
Quiz	15%
Mid Exam	25%
Final Exam	30%

Presentation/Research	10%
Total	100%

Grade Conversion: A: (90-100), B: (80-89), C: (70-79), D: (60-69), F: (0-59)

Course Expectations

Attendance Policy

Students are expected to attend all classes for their full length. Significant absence in class may result in grades penalty. See section below on *Staying Home When Sick*.

Homework

Homework is required to be turned in before or at the **beginning** of class on the due date for grading. Problem solutions for the HW must be presented as a professional looking document. Include schematics, proper labeling, pertinent property diagrams, “Given” and “Find” statements, assumptions, equations to be used, etc. Problem solutions presented in paper torn out of a spiral notebook will not be accepted. Any assignment turned in after the beginning of the class period will be considered late and 1/3rd of the possible score will be lost. Assignments will not be accepted more than one class period late without prior instructor consent and in such cases the student will receive an assignment grade of zero.

Course Communication

Students are expected to check emails and D2L for the updates or questions related to the course. All the lecture notes, assignments and any announcements will be communicated through D2L.

HELP: Any student needing additional help is encouraged to contact me during office hours. If you cannot come during office hours, an appointment may be set up. Please do not wait until the last minute to seek help with assigned homework.

Students with disabilities, who believe that they may need special accommodations in this class, need to contact the Career and Counseling Center (Room J253) at 678-915-7361 as soon as possible. The center will arrange such accommodations.

Course Outline

- * Note that the Instructor may update the schedule any time. See online version on D2L for updates. See *Assignments* and Announcements on D2L for specific homework problems that may be collected for grading and their due dates.

CONTENTS

Introductions and basic concepts	Week #1
Heat Conduction Equation	Week #2
Steady Heat Conduction	Week #3,4
Transient Heat Conduction	Week #5,6

Numerical Methods in Heat Conduction	Week #7,8
Fundamentals of Convection	Week #9
External Forced Convection	Week #10
Internal Forced Convection	Week #11
Natural Convection	Week #12
Heat Exchangers	Week #13
Fundamentals of Thermal Radiation	Week #14
Radiation Heat Transfer	Week #15

KSU Academic Integrity Statement

Every KSU student is responsible for upholding the provisions of the [Student Code of Conduct](#), as published in the Undergraduate and Graduate Catalogs. Section 5c of the Student Code of Conduct addresses the university’s policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to university materials, misrepresentation/falsification of university records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the Department of Student Conduct and Academic Integrity (SCAI), which includes either an “informal” resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct’s minimum one semester suspension requirement.

Help Resources

Contacts to get Help

Student Help Desk: email studenthelpdesk@kennesaw.edu or call 470.578.3555 or go to this webpage for the [KSU Service Desk Portal](#) or go to: <https://uits.kennesaw.edu/>

All Federal, BOR and KSU Student Policies, and COVID-19 Policies

<https://cia.kennesaw.edu/instructional-resources/syllabus-policy.php>

KSU Student Resources (including Wellness and Academic)

<https://cia.kennesaw.edu/instructional-resources/syllabus-resources.php>

KSU Coronavirus (COVID-19) Information and Recourses

<https://coronavirus.kennesaw.edu/>

SPCEET College Tutoring Center

The Southern Polytechnic College offers drop-in tutoring at its Peer Mentoring Center, located in room Q 306. Tutors are available for a dozen subjects, including Graphics, Dynamics, and others. Online tutoring support may also be available. The complete list of supported courses, as well as a schedule of availability for each subject, can be found on the college website at engineering.kennesaw.edu/peer-mentoring-center. The center is open from 8 AM to 9 PM, Monday through Saturday. Email questions to peermentoringcenter@kennesaw.edu.

Basic Needs Security Statement

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact CARE Services (care.kennesaw.edu). The Campus Awareness, Resource and Empowerment (CARE) Services offers support to students who have experienced homelessness, food insecurity and/or the foster care system. Contact them at 470-578-5260 or careservices@kennesaw.edu for help.



KSU CARES

CAMPUS PANTRY

KSU CARES provides food for ANY KSU student. Pantries located on both campuses.

CASE MANAGEMENT

Case Managers provide students with individualized plans intended to empower the student to work towards their daily living needs.

KENNESAW CAMPUS

Carmichael Student Center, Room 172

MARIETTA CAMPUS

JMW Student Center, Room 184

care.kennesaw.edu | 470-578-5260

CARE always Cares



EMERGENCY ASSISTANCE PROGRAM

ELIGIBILITY

Open to all currently enrolled KSU students with a FAFSA on file.

FINANCIAL ASSISTANCE

Financial assistance is available on a case-by-case basis to assist students in overcoming unforeseen hardships.

CONNECTION TO RESOURCES

Beyond financial assistance, staff work to connect students with on-campus and off-campus resources to relieve financial burdens.

emergencyassistance.kennesaw.edu

CARE always Cares

