BGSU School of Engineering

BOWLING GREEN STATE UNIVERSITY

ENGT 3480/Thermodynamics and Heat Transfer
Spring/2025
MW/12:30AM-1:50PM

Instructor: Md Mahmudur Rahman "Mahmud"
Office #: Technology 219
Office Telephone #: 419-372-6684
e-Mail: *mdmahmr@bgsu.edu*
Office Hours: (*2:00-3:00PM MW*)

Required Readings: Thermodynamics: An engineering Approach *by Yunus Cengel, Michael Boles and Mehmet Kanoglu* ISBN-10: 1265903697, Publisher: McGraw Hill, 10th edition

Recommended Readings:

1. Fundamentals of Heat and Mass Transfer by Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt. Publisher: Wiley 8th edition

2. Fundamentals of Thermal-Fluid Sciences by Yunus Cengel, John Cimbala and Afshin Ghajar, Publisher: McGraw Hill,

GENERAL COURSE DESCRIPTION

This course provides a comprehensive introduction to the fundamental principles of thermodynamics and heat transfer. Topics include basic concepts and definitions, properties of pure substances, work and heat interactions, the first and second laws of thermodynamics, entropy, thermodynamic processes for gases, vapors, and liquids in both flow and non-flow systems, as well as irreversibility and availability. Heat transfer fundamentals such as conduction, convection, and thermal radiation are also covered. Emphasis is placed on control volume analysis for open and closed systems, conservation of energy and mass, and the concept of entropy and thermodynamic losses.

Prerequisite(s): A grade of at least C in all of the following courses: PHYS 2010 or PHYS 2110, and MATH 1310.

COURSE OBJECTIVE

1. Understand and explain the fundamental principles of thermodynamics, including the first and second laws, entropy, and energy conservation.
2. Analyze the thermodynamic properties of pure substances and apply these properties to various non-flow and flow processes for gases, vapors, and liquids.
3. Perform control volume analyses for open and closed systems, applying conservation of mass and energy principles.

4. Identify and evaluate irreversibility and availability in thermodynamic processes to assess system performance.
5. Demonstrate a strong understanding of heat transfer mechanisms, including conduction, convection, and radiation, and apply these principles to real-world engineering problems.
6. Develop problem-solving techniques for thermodynamics and heat transfer systems, and apply them to practical scenarios in engineering.
7. Integrate theoretical concepts with practical applications, enhancing their ability to design and evaluate heat and fluid transfer systems effectively.

INSTRUCTOR BIO:

Dr. Rahman holds a Ph.D. in Mechanical Engineering from the University of Louisville and has over 12 years of experience in academia and advanced research. He teaches courses in Thermodynamics, Fluid Mechanics, Heat Transfer, Materials Science, Advanced Engineering Mathematics, and Engineering Design. Dr Rahman developed a simulation technique to enhance understanding of colloidal suspensions and worked in interfacial coalescence. Dr. Rahman's research career includes notable postdoctoral appointments at Argonne National Laboratory, the University of Delaware, and Georgia Southern University. His work has been internationally recognized, earning nominations for awards such as Best Robotics Paper at MARSS 2022 and the ASGSR International Space Station Lab Best Poster Award in 2019. He has presented at numerous conferences and published in prestigious journals, including *Journal of Colloid and Interface Science* and *Physics of Fluids*. Dr. Rahman integrates hands-on learning into his teaching and is committed to advancing the understanding of complex engineering systems.

HOMEWORK AND QUIZ POLICIES:

There will be a total of 7 homework assignments in this course, and students are required to submit them by the specified deadlines. For each homework assignment, a few problems (typically 5) will be assigned. Out of these, 2 or 3 problems will be graded, and the graded problems will be announced in advance when the homework problems are assigned. Following each homework submission, a quiz will be conducted based on the homework content, and the quiz grade will account for 80% of the total (assignment+quiz) grade. Out of the 7 (HWs+Quizzes), the best 6 (HWs+Quizzes) grades will be considered in the final evaluation. Students are strongly encouraged to complete all homework thoroughly, as the quizzes will test their understanding of the material covered.

STUDENT EVALUATION

2 Tests	- 40%
Final (Comprehensive)	- 30%
HWs and Quizzes	- 30%

ATTENDANCE POLICY

Being late or absent during meetings of this course will adversely affect your grade. Attendance will be taken at every class meeting. University policy provides that the instructor has no obligation to give makeup exams or provide additional time to make up missed work resulting from absence from class. If you are absent and miss an important assignment, a makeup will be allowed only if

you provide a written explanation from a doctor, employer, or other appropriate source.

If students are absent from class, even when it is due to a field trip or other University sponsored event, it is entirely the student's responsibility to notify professor and determine if the work can be made up. Participation in a field trip or event does not mean that the student is "excused" from class until and unless the professors in the missed classes excuse them.

COURSE GRADE

90 or more	A
80-90.	B
70-80	C
60-70	D
60 and below	F

ACADEMIC HONESTY

If there is evidence of plagiarism on any assignment, the student will receive a zero for the assignment and a letter grade drop for the course. This penalty will also apply to the individual that provided the assignment. All the instances of academic dishonesty will be reported according to the University policy.

Complete BGSU Academic honesty policy can be found at
http://www.bgsu.edu/content/dam/BGSU/catalog/academic-honesty/official-policy.pdf

ACCESSIBILITY POLICIES

Please inform me and the appropriate individual at the BGSU Accessibility Services office of any disability that can affect your ability to perform well in this course. The AS office will provide equal access and reasonable accommodations to BGSU students with disabilities. The office is located at 38 College Park Office Building on Main Campus or Firelands Campus at 105 George Mylander Hall, phone 419-372-8495, e-mail access@bgsu.edu. The link to the disability service website is Student Accessibility Information.

DICLAIMER

- The instructor reserves the right to adjust the syllabus anytime during the semester.
- Checking phones, text, email, and general internet activity during lecture/class time is prohibited unless given permission by the instructor.
- There will be no make-up exams unless approved by the instructor in advance.

COURSE SCHEDULE (ENGT 3480)

Date	**Topic**	
01/13, 01/15 **Week 1**	Course syllabus, **Chapter one:** Introduction and Basic concepts, Dimensions and Units, Systems and control volume	
01/22 **Week 2**	**Chapter one:** Properties, continuum concept, State and equilibrium, Process and Cycle	
01/27, 01/29 **Week 3**	**Chapter one:** Pressure, Chapter two- Forms of energy, energy transfer	Quiz 1
02/03, 02/05 **Week 4**	**Chapter two:** Mechanical forms of work, first law of thermodynamics, practice problems	Quiz 2
02/10, 02/12 **Week 5**	**Chapter three:** Pure substances, Phase, Phase change Saturated liquid vapor mixture	
02/17, 02/19 **Week 6**	**Chapter three:** Ideal gas equation of States **Exam 1**	Exam 1 (02/19)
02/24, 02/26 **Week 7**	**Chapter four:** Moving Boundary Work, Energy Analysis Specific heats, enthalpy, internal energy	
03/03, 03/05 **Week 8**	**Spring break (No classes)**	
03/10, 03/12 **Week 9**	**Chapter four:** Energy analysis of closed systems **Chapter five:** Mass and energy analysis of control volumes	Quiz 3
03/17, 03/19 **Week 10**	**Chapter five:** Steady Flow Engineering Devices Practice problems	Quiz 4
03/24, 03/26 **Week 11**	**Chapter six:** Second Law of Thermodynamics for Open and Closed Systems	Exam 2 (03/26)
03/31, 04/02 **Week 12**	**Chapter six:** Carnot Heat Engine, Refrigerator, and Heat pump **Chapter seven:** Entropy and Entropy analysis	
04/07, 04/09 **Week 13**	Practice Problems on Entropy analysis **Chapter sixteen (2nd textbook):** Heat Conduction	Quiz 5
04/14, 04/16 **Week 14**	Convection Heat Transfer Thermal Radiation	
04/21, 04/23 **Week 15**	Practice problems on Heat Transfer Final Exam review	Quiz 6
Week 16	Final Exam	4/28