North Central State College

MASTER SYLLABUS	2025-2026

A. Academic Division: Engineering Technology, Business & Criminal Justice Division

B. Discipline: Mechanical Engineering Technology

C. Course Number and Title: MECT3171 Applied Thermodynamics

D. Assistant Dean: Brooke Miller, M.B.A.

E. Credit Hours: 3
Lecture: 2 hours
Lab: 2 hours

F. Prerequisites: MECT 3031, MATH 1151

G. Last Course/Curriculum Revision Date: Fall 2025 Origin date: 01/25/2021

H. Textbook(s) Title:

Thermodynamics: An Engineering Approach with Connect

- Authors: Cengel, Boles
- Copyright Year: 2024
- Edition: 10th Edition
- ISBN: 9781264925742 Print with Connect
- ISBN: 9781265899653 Rental with Connect

I. Workbook(s) and/or Lab Manual:

J. Course Description: This course explores the basic principles and laws of classical thermodynamics, equations of state, reversibility and entropy applied to processes and cycles for ideal and non-ideal substances. Special attention will be given to gas power cycles, vapor and combined power cycles, refrigeration cycle. Air conditioning processes and mechanics of heat transfer will also be studied.

K. College-Wide Learning Outcomes:

College-Wide Learning Outcome	Assessments - - How it is met & When it is met
Communication – Written	
Communication – Speech	
Intercultural Knowledge and Competence	
Critical Thinking	
Information Literacy	
Quantitative Literacy	

L. Course Outcomes and Assessment Methods:

Upon successful completion of this course, the student shall:

Outcomes	Assessments – How it is met & When it is met
1. Use appropriate tables and diagrams to determine the state of the working fluid.	Problem based quizzes, and exams
2. Calculate thermal efficiencies, heat transfer in & out, work in & out, etc. for ideal thermodynamic cycles, as Otto, Diesel, Brayton, Rankine, and refrigeration cycles.	Problem based quizzes, and exams
3. Calculate / investigate actual engine cycles and compare them with the idealized ones as well as identifying viable ways to improve the thermal efficiencies of the engine cycles as Otto and Diesel and power cycles as Brayton and Rankine.	Problem based quizzes, and exams
4. Conduct laboratory experiments, analyze and interpret experimental data.	Laboratory reports
5. Produce written technical and laboratory reports.	Laboratory reports

ABET Outcomes:

- *Outcome c*. Perform selection, set-up, and calibration of measurement tools/instrumentation;
- *Outcome i*. Thermal sciences (such as thermodynamics, fluid mechanics, heat transfer, etc.);
- *Outcome k*. Application of industry codes, specification and standards;
- *Outcome l.* Technical communications typically used in preparation of engineering proposals, reports, and specifications.

M. Recommended Grading Scale:

NUMERIC	GRADE	POINTS	DEFINITION
93–100	A	4.00	Superior
90–92	A-	3.67	Superior
87–89	B+	3.33	Above Average
83–86	B	3.00	Above Average
80–82	B-	2.67	Above Average
77–79	C+	2.33	Average
73–76	C	2.00	Average
70-72	C-	1.67	Below Average
67–69	D+	1.33	Below Average
63-66	D	1.00	Below Average
60-62	D-	0.67	Poor
00--59	F	0.00	Failure

N. College Procedures/Policies:

North Central State College believes that every student is a valued and equal member of the community.* Every student brings different experiences to the College, and all are important in enriching academic life and developing greater understanding and appreciation of one another. Therefore, NC State College creates an inclusive culture in which students feel comfortable sharing their experiences. Discrimination and prejudice have no place on the campus, and the College takes any complaint in this regard seriously. Students encountering aspects of the instruction that result in barriers to their sense of being included and respected should contact the instructor, assistant dean, or dean without fear of reprisal.

* *Inclusive of race, color, religion, gender, gender identity or expression, national origin (ancestry), military status (past, present or future), disability, age (40 years or older), status as a parent during pregnancy and immediately after the birth of a child, status as a parent of a young child, status as a foster parent, genetic information, or sexual orientation*

Important information regarding College Procedures and Policies can be found on the syllabus supplement located at https://ncstatecollege.edu/documents/President/PoliciesProcedures/PolicyManual/Final%20PDFs/14-081b.pdf

North Central State College

SYLLABUS ADDENDUM

Academic Division:	Engineering Technology, Business and Criminal Justice Division	**Discipline:**	Mechanical Engineering Technology
Course Coordinator:			
Course Number:	MECT-3171-30	**Course Title:**	Applied Thermodynamics
Semester / Session:	Spring 2026 / Full Semester	**Start / End Date:**	01/12/2026 – 05/08/2026

Instructor Information

Name:	Md Saiful Islam	**Credentials:**	Ph.D. in Geological Sciences, M.S. in Petroleum Engineering, and B.S. in Mechanical Engineering
Phone Number:	419-755-4717	**E-Mail Address:**	sislam@ncstatecollege.edu
Office Location:	Kehoe 234	**Office Hours:**	Tuesday & Thursday: 10:00 AM - 12:30 PM

I. Topical Timeline (Subject to Change):

Weeks	Topics	Assignment	Due Date
1	Review: The Second Law of Thermodynamics		
2-3	Entropy: Clausius Inequality and Entropy, Entropy Generation and the Increase of Entropy Principle, Entropy Changes of Pure Substances, Isentropic Processes, Property Diagrams Involving Entropy, what is Entropy, Differential Entropy Change Relations, Entropy Change of Liquid and Solids, The Entropy Change of Ideal Gases.	Quiz-1	01/29/2026
4-5	Gas Power Cycle: Stirling and Ericsson Cycles, Brayton Cycle, The Brayton Cycle with Regeneration, The Brayton Cycle with Intercooling, Reheating, and Regeneration, Ideal Jet-propulsion Cycles, Lab-1.	Quiz-2 Lab-1 Lab-2	02/12/2026
6-7	Vapor and Combined Power Cycles: The Carnot Vapor Cycle, Rankine Cycle, How Can We Increase the Efficiency of the Rankine Cycle, The Ideal Reheat Rankine Cycle, The Ideal Regenerative Rankine Cycle, Lab-2 & 3.	Quiz-3/Home Work Lab-3 Lab-4	02/19/2026
8	Contents covered in Weeks 1 to 7	Midterm Exam	03/05/2026
9	Spring Break - No Class		03/09/2026 – 03/13/2026
10-11	Refrigeration Cycles: Refrigerators and Heat Pumps, The Reversed Carnot Cycle, The Ideal Vapor-compression Refrigeration Cycle, Actual Vapor-compression Refrigeration Cycle, Selecting the Right Refrigerant, Heat Pump Systems, Lab-4 & 5.	Quiz-4 Lab-5 Lab-6	04/09/2026
12-13	Gas Mixtures: Composition of a Gas Mixture: Mass and Mole Fractions, P-v-T Behavior of Gas Mixtures: Ideal and Real Gases, Properties of Gas Mixtures-Ideal and Real Gases.	Quiz-5/Home Work Lab-7	04/23/2026
14-15	Gas–Vapor Mixtures and Air-Conditioning	Lab-8	
16	Review		
17	**Final Exam**		05/07/2026
NOTE: This is a tentative schedule. Assignments and due dates may be changed at the discretion of the instructor.			

II. Grading and Testing Guidelines:

- Final Grade Calculation:

Activity	Qty	Points	Percentage
Quizzes/Home Works	5	500	30
Mid Term Exam	1	100	25
Lab	8	800	20
Final Exam	1	100	25

- College Recommended Grading Scale:

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67–69	D+	1.33	Below Average
63-66	D	1.00	Below Average
60-62	D-	0.67	Poor
00-59	F	0.00	Failure

III. Examination Policy:

1. The reasons for which a student will be excused from taking an examination:
   a. Hospitalization (with documented verification)
   b. Death in the immediate family (with documented verification)
   c. Personal illness or illness in immediate family - (doctor's excuse required).

2. A student who misses an examination for any reason is responsible for:
   a. Notifying the instructor before the day of the examination.
   b. Set up a new date for the examination through email from instructor.

3. No makeup opportunity will be given for absences of quizzes.

IV. Class Attendance and Homework Make-Up Policy:

Attendance is required per NCSC policy. Class Absentees: No merit or demerit derived from attendance, unless it prevents you from taking a quiz or examination. Homework value will lose 10% per day late.

V. Classroom Expectations:

1. **Questions in class:** Any questions regarding the material are welcome during the class. If something is not clear to you, it probably is not clear to others. So, ask questions. Your question not only helps yourself, but it also helps others. If your question is too specific and its answer is too long, I may invite you to ask me later in my office.

2. **Office hours:** Take the full advantage of the office hours. Any questions regarding assignments, exam reviews, or general understanding of the material are welcome. If you cannot make the scheduled office hours, appointments can be made in class or by email.

3. **Diagrams:** The importance of diagrams in this course, and generally in Mechanical Engineering, cannot be possibly over- emphasized. Their benefit is two-fold; a) Diagrams help you imagine a problem's scenario, so you will not leave out any details and your solution will be accurate, b) Diagrams are a good tool to represent your solution more clearly to your audience (here, a grader for example, and later to your manager/colleagues). Both a) and b) will enhance your performance as a student and as a future engineer.

4. **Assignments:** Doing the assignments is extremely important. As you will see, the concepts of Thermodynamics are very simple. Applying them to different problems, however, is challenging at least. You can master the application techniques only by practicing. So, do not neglect the assignments. The assigned homework problems are the bare minimum number required for you to consider. You must solve as many extra problems on your own as possible for best results in this course.