

**Course Title: Thermodynamics**  
**Course #: ME 354**

**Credit Hours: 3**  
**Semester: Spring, 2022**  
**Cap: 10**

**Faculty:** Alden Yellowhorse **E-mail:** a.yellowhorse@navajotech.edu  
**Office:** TECH 325, Science and Tech. Building **Office Phone:** NA  
**Office Hours:** 9:30 – 10:50 Tu Th F  
**Preferred Communication** (email; will respond within 24 hours):  
**Class Location:** ENGR CLRM  
**Class Meeting Times:** 11:00 – 12:20 M W

**Required Materials:**

**Textbooks:** Fundamentals of Engineering Thermodynamics, 9th Edition, Michael J. Moran, ISBN: 978-1-119-39138-8

**Mission, Vision, and Philosophy**

**Mission:** Navajo Technical University honors Diné culture and language, while educating for the future.

**Vision:** Navajo Technical University provides an excellent educational experience in a supportive, culturally diverse environment, enabling all community members to grow intellectually, culturally, and economically.

**Philosophy:** Through the teachings of Nitsáhákees (thinking), Nahátá (planning), Íina (implementing), and Siihasin (reflection), students acquire quality education in diverse fields, while preserving cultural values and gaining economic opportunities.

**Course Description**

In this class, students will learn to 1) apply thermodynamic laws in engineering problems, 2) evaluate the impact of phase changes on thermodynamics and 3) analyze the properties of engines. Topics in this course include: Laws of Thermodynamics, Phases of substances, processes and cycles, Work and heat, Control Volumes, Entropy and Enthalpy.

<b>Course Outcomes</b>	<b>Course Assessments</b>
Understand and apply the first law of thermodynamics	Problems on conservation of energy
Know and apply the second law of thermodynamics	Analyze systems based on this principle
Successfully model ideal gas behavior	Problems and experiments
Use steam tables to solve problems	Real-world modeling
Demonstrate familiarity with various engine cycles	Essay and true-false questions
Solve psychrometric engineering problems	Problems and experiments
Characterize and solve open-system problems	Assignments and projects

## Course Activities

Week	Date	Class Topics/Reading Due
1		
1	19-Jan	Chapter 1: Introduction, surveys, system definitions, equilibrium, units
2	24-Jan	<b>Last day to add/drop</b> Pressure, temperature and methodology and units
	26-Jan	Sections 2.1 – 2.4: mechanical, expansion and heat energy
3	31-Jan	Sections 2.1 – 2.4: continued practice
	2-Feb	Sections 2.5 – 2.7: Energy balances and cycles
4	7-Feb	Sections 3.1 – 3.5: p-v-T relations, phase change and fluid tables
	9-Feb	Sections 3.5 – 3.6: Vapor, liquid and saturation tables and enthalpy
5	14-Feb	Sections 3.9 – 3.11: Specific heats, fluid properties and compressibility charts
	16-Feb	Section 3.12 – 3.13: Ideal gasses, internal energy, enthalpy
6	21-Feb	Holiday
	23-Feb	Section 3.14: Applying energy balance using ideal gas tables
7	28-Feb	Sections 4.1 – 4.2: Conservation of mass
	2-Mar	Sections 4.4 – 4.6: Energy balances and nozzles/diffusers
8	7-Mar	Midterm review
	9-Mar	<b>Midterm</b>
9	14-Mar	Holiday
	16-Mar	Holiday
10	21-Mar	Sections 4.7 – 4.8: Turbines, compressors and pumps
	23-Mar	Sections 4.9 – 4.10: Heat exchangers and throttling devices
11	28-Mar	Sections 5.1 – 5.3: Second law, irreversible and reversible processes
	30-Mar	Sections 5.4 – 5.7: Applying the second law to cycles
12	4-Apr	Sections 5.9 – 5.11: Carnot, power and refrigeration cycles
	6-Apr	Project day
13	11-Apr	Sections 6.1 – 6.2: Entropy applications
	13-Apr	Sections 6.3 – 6.5: Entropy change in incompressible and ideal substances
14	18-Apr	Sections 6.6 – 6.8: Entropy balance and directionality
	20-Apr	Project day
15	25-Apr	Sections 6.11 – 6.13: Isentropic processes
	27-Apr	Sections 6.11 – 6.13: Isentropic processes
16	2-May	Project day
	4-May	Final review
17	9-May	<b>Final</b>

## Grading Plan

Homework	35%	A = 100 - 90%
Mid-term	15%	B = 89.9 - 80%
Final Exam	20%	C = 79.9 - 70%
Project	20%	D = 69.9 - 60%
Quizzes	7%	F < 60%
Class Participation	3%	

## Grading Policy

Students must do their own work. Cheating and plagiarism are strictly forbidden. Cheating includes (but is not limited to) plagiarism, submission of work that is not one's own, submission or use of falsified data,

unauthorized access to exams or assignments, use of unauthorized material during an exam, or supplying or communicating unauthorized information for assignments or exams.

### **Participation**

Students are expected to attend and participate in all class activities. Points will be given to students who actively participate in class activities including guest speakers, field trips, laboratories, and all other classroom events.

### **Cell phone and headphone use**

Please turn cell phones off **before** coming to class. Cell phone courtesy is essential to quality classroom learning. Headphones must be removed before coming to class.

### **Attendance Policy**

Students are expected to attend all class sessions. If more than ten minutes late, students will be counted as absent. A percentage of the student's grade will be based on class attendance and participation. Absence from class, regardless of the reason, does not relieve the student of responsibility to complete all course work by required deadlines. Furthermore, it is the student's responsibility to obtain notes, handouts, and any other information covered when absent from class and to arrange to make up any in-class assignments or tests if permitted by the instructor. Incomplete or missing assignments will necessarily affect the student's grades. Instructors will report excessive and/or unexplained absences to the Counseling Department for investigation and potential intervention. **Instructors may drop students from the class after three (3) absences unless prior arrangements are made with the instructor to make up work and the instructor deems any excuse acceptable.**

### **Study Time Outside of Class for Face-to-Face Courses**

**For every credit hour in class, a student is expected to spend two hours outside of class studying course materials.**

### **Study Time for Hybrid or Blended Courses**

**For a hybrid or blended course of one credit hour, a student is expected to spend three hours per week studying course materials.**

### **Study Time for Online Courses**

**For an online course of one credit hour, a student is expected to spend four hours per week studying course materials.**

### **Academic Integrity**

Integrity (honesty) is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Students who engage in academic dishonesty diminish their education and bring discredit to the University community. Avoid situations likely to compromise academic integrity such as: cheating, facilitating academic dishonesty, and plagiarism; modifying academic work to obtain additional credit in the same class unless approved in advance by the instructor, failure to observe rules of academic integrity established by the instructor. **The use of another person's ideas or work claimed as your own without acknowledging the original source is known as plagiarism and is prohibited.**

### **Diné Philosophy of Education**

The Diné Philosophy of Education (DPE) is incorporated into every class for students to become aware of and to understand the significance of the four Diné philosophical elements, including its affiliation with the four directions, four sacred mountains, the four set of thought processes and so forth: Nitsáhákees,

Nahát'á, Íina and Siih Hasin which are essential and relevant to self-identity, respect and wisdom to achieve career goals successfully.

At NTU's Zuni Campus, the A:shiwi Philosophy of Education offers essential elements for helping students develop Indigenous and Western understandings. Yam de bena: dap haydoshna: akkyá hon detsemak a:wannikwa da: hon de:tsemak a:ts'umme. *Our language and ceremonies allow our people to maintain strength and knowledge.* A:shiwi core values of hon i:yyułashik'yanna:wa (respect), hon delank'oha:willa:wa (kindness and empathy), hon i:yyayumola:wa (honesty and trustworthiness), and hon kohoł lewuna:wediyahnan, wan hon kela i:tsemanna (think critically) are central to attaining strength and knowledge. They help learners develop positive self-identity, respect, kindness, and critical thinking skills to achieve life goals successfully.

### **Students with Disabilities**

Navajo Technical University is committed to serving all students in a non-discriminatory and accommodating manner. Any student who feels that she or he may need special accommodations should contact the Accommodations Office (<http://www.navajotech.edu/student-services#accomodations-services>) in accordance with the university's Disability Accommodations Policy (see [http://www.navajotech.edu/images/about/policiesDocs/Disability\\_Exhibit-A\\_6-26-2018.pdf](http://www.navajotech.edu/images/about/policiesDocs/Disability_Exhibit-A_6-26-2018.pdf)).

### **Email Address**

Students are required to use NTU's email address for all communications with faculty and staff.

### **Final Exam Date:**