ME 301: Fundamentals of Thermodynamics

This is a cooperative course taught jointly by WSU and the University of Idaho.

Course description:	Thermodynamic properties of matter, ideal and real gases, work and heat, first and second laws and their application to engineering systems.
Number of credits:	3. This course is required.
Course Coordinator:	R.F. Richards
Prerequisites by course:	Physics 201 with a grade of C or better
Prerequisites by topic:	1. Differentiation 2. Integration 3. Conservation of mass 4. Conservation of energy
Postrequisites:	ME 402; ME 303 (recommended)
Textbooks/other required materials:	1. Cengel, Y. *Property Tables Booklet/Thermodynamics.* McGraw-Hill, 2010, 7/e. 2. Cengel, Y.A. and Boles, M.A. *Thermodynamics: An Engineering Approach.* McGraw-Hill, 2014, 8/e.
Course objectives:	1. Determine the properties of pure substances using thermodynamic tables. 2. Use the ideal gas law. 3. Calculate changes in internal energy and enthalpy using specific heats. 4. Calculate the work done by a closed system via integration. 5. Apply the first law of thermodynamics to a closed system. 6. Apply the first law of thermodynamics to an open system. 7. Analyze the Carnot, Otto, and Rankine thermodynamic cycles. 8. Apply the second law of thermodynamics. 9. Calculate changes in entropy using thermodynamic tables. 10. Calculate changes in entropy for ideal gases.
Topics covered:	1. Basic concepts of Properties in pure substance. 2. First law of thermodynamics for closed systems. 3. First law of thermodynamics for control volumes. 4. Second law of thermodynamics; Carnot Cycle; thermodynamic temperature scale. 5. Concept and calculation of entropy. 6. Gas power cycles; Vapor cycles. 7. Refrigeration cycles.

Expected learning outcomes:

1. An understanding of how an automobile engine runs, how a utility plant generates electricity, and how a refrigerator keeps the icebox cold.
2. Ability to analyze the performance of an engine, a power plant, or a refrigerator by applying the first law of thermodynamics.
3. Ability to determine the fundamental limits on the operation of these devices using the second law of thermodynamics.

Class schedule: Three 50-minute lecture sessions per week, for one semester.

Laboratory schedule: None.

Contribution to meeting the professional component: Engineering Topics

Relationship of course to student outcomes:
3 strongly supported; 2 supported; 1 minimally supported

Student Outcomes Pre-Fall 2018 (ABET EC2000)

a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
3										

Student Outcomes Fall 2018 forward (ABET EC2019)

1	**2**	**3**	**4**	**5**	**6**	**7**
3						

Prepared by: Andrea Butcherite and R.F. Richards *Date:* May 30, 2018