

**MEC 521 Thermodynamics
Spring 2020**

Monday/Wednesday 10:00am to 11:20am—Phys. P127
Office Hours: Wednesday 11:40AM to 1:00PM

Course description: This course begins with a review of the fundamental concepts and laws of classical thermodynamics. Then the thermostatic theory of equilibrium states ~~and phase transitions~~ is treated, followed by the thermodynamic theory of processes of simple systems and composite systems, including [application of Carnot] heat engines [to a high-temperature heat body as well as isolated composite systems]. ~~Special topics may include statistical mechanics, irreversible thermodynamics, radiation and photovoltaic energy conversion, biological thermodynamic processes, and other topics of current interest.~~

Learning Objectives:

- #1_ Definitions of temperature and heat
- #2_ First law of thermodynamics
- #3_ Second law of thermodynamics (which version?!)
- #4_ Meaning and definition of energy
- #5_ Refutation of the energy principle (the principle of universal degradation of mechanical energy)
- #6_ Reversible and reversible-like processes
- #7_ Production and transfer of heat vs extraction of heat
- #8_ Free energy and the exergetic content of energy
- #9_ Refutation of “impossibility of heat being entirely converted into mechanical work”
- #10_ Universal entropy growth principle and the concept of entropy growth potential, and the triadic framework of reversible and reversible-like processes
- #11_ Application of equilibrium thermodynamics to thermodynamic property relations

Required materials: L-S Wang, *A Treatise of Heat and Energy* (Springer-MES, 2020)
Enrico **Fermi**, *Thermodynamics* (1936; Dover 1956)

Topics and Schedule:

		Comment and other source materials	Learning objective
01/27	Introduction: The mechanical theory of heat (MTH) The 1865-1887 entropy principle’s advent Planck set the standard pedagogy of MTH	Reviews of Planck’s “Treatise of Thermodynamics” (Fermi is recommended as a simpler intro to Planck)	
01/29	Chapters 1 and 2, <i>A Treatise of Heat and Energy</i>	Fermi , Chapter 1	#1
02/03, 02/05	Chapters 3, <i>A Treatise of Heat and Energy</i>	Fermi , Chapter 2	#2
02/10, 12, 17	Chapters 4, <i>A Treatise of Heat and Energy</i>	Fermi , Chapter 3	#3, #4

02/19, 24, 26	Chapters 5, <i>A Treatise of Heat and Energy</i>	Fermi, Chapter 4	#3, #1, #5
03/02, 04	Chapters 6, <i>A Treatise of Heat and Energy</i> : Classical formalism of thermodynamics Modern formalism of thermodynamics (definition of entropy) Internal reversibility, quasi-static processes, reversible and reversible-like processes		#6, #7
03/09	Chapters 7, <i>A Treatise of Heat and Energy</i>	Fermi, Chapter 5	
03/11	Midterm		
03/23	Continuing Chapters 7, <i>A Treatise of Heat and Energy</i>	Fermi, Chapter 5	#4, #8
03/25, 30	Chapters 8, <i>A Treatise of Heat and Energy</i>		
04/01, 06, 08	Chapters 9, <i>A Treatise of Heat and Energy</i>	Fermi, Chapter 6	#11
04/13	Guest lecture on special topic		
04/15	Guest lecture on special topic		
04/20, 22	Continuing Chapters 8, <i>A Treatise of Heat and Energy</i>		#3, #6, #9, #10
04/27	Chapters 10, <i>A Treatise of Heat and Energy</i>		#6, #7
04/29, 05/04	The new, entropy-centric, mechanical theory of heat: A preview of the new book project		#2, #3
05/04, 06	Review		
	Final		

GRADING WEIGHT:

Homework—0%

First midterm—30%

Second examination—50%

Quizzes—20%

DISABILITY SUPPORT SERVICES (DSS) STATEMENT

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

ACADEMIC INTEGRITY STATEMENT:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

CRITICAL INCIDENT MANAGEMENT:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.