

Spring 2022

## MTSE 602-102: Thermodynamics of Materials

Trevor Tyson

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### Recommended Citation

Tyson, Trevor, "MTSE 602-102: Thermodynamics of Materials" (2022). *Physics Syllabi*. 466.  
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# Thermodynamics of Materials (MTSE 602)

## Course Outline

Prof. Trevor A. Tyson

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Tel: 973-642-4681

Office: Room 484 Tiernan Hall

- Class will meet on Tuesday from 6:00 to 9:00 PM in Faculty Room 413 (3 Credits)
- Office hour is Tuesday 5:00 to 6:00 PM (or by appointment)
- Class WWW page can be found at <http://web.njit.edu/~tyson/mtse602.html> (under construction)
- Assignments are due each week at the beginning of class
- Textbook: *Introduction to the Thermodynamics of Materials* (4<sup>th</sup> Edition) by D. R. Gaskell and D. E. Laughlin
- Supplementary Texts:
  - (1) *Thermodynamics of Materials* Vol I and II, by D. V. Ragone (Wiley)
  - (2) *Thermal Physics* by C. Kittel and H. Kroemer (2<sup>nd</sup> Edition, Freeman)
  - (3) *Thermodynamics* by E. Fermi (Dover)
  - (4) *Physical Chemistry* by R. A. Albert and R. A. Silbey (3<sup>rd</sup> Edition, Freeman)
- Study Guides:
  - (1) Schaum's Outline Series: *Thermodynamics* (2<sup>nd</sup> Edition, McGraw-Hill)
  - (2) *REA's Problem Solvers: Thermodynamics* (REA)

### Grade Decomposition

Homework	10%	(Posted on class website, after lectures)
Quizzes	10%	
Exam I	10%	
Midterm Exam	20%	
Final Exam	25%	(comprehensive)
Class Project	25%	

### Grade Cutoffs

87% – A
82% – B+
72% – B
65% – C+
55% – C
45% – D
Below 45% – F

### Class Project Details

- Find paper relevant to material covered in class
- Read and research paper (look-up references)
- Present paper in class in 15 min. talk
- Write 7 page report (1.5 space, not including figures)
- See list of research project papers on main class WWW page

***Honor Code Violations or Disruptive Behavior:*** NJIT has a zero-tolerance policy for cheating of any kind and for disruptive student behavior. Violations will be reported to the Dean of Students. The

penalties range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT. Avoid situations where your own behavior could be misinterpreted as dishonorable.

- **Students are required to agree to the NJIT Honor Code on each exam and quiz.** By taking an exam or quiz you agree to abide by the code.

Turn off all smart and cellular phones, wireless devices, computers, and messaging devices of all kinds during classes and exams. Please do not eat, drink, or create noise in class that interferes with the work of other students or instructors.

**Homework problems are posted on the class web site**

TOPIC	TEXT STUDIES
Week 1 (Jan. 18 to 24 ) Introduction and Definition of Terms The First Law of Thermodynamic	Chapter 1 Chapter 2
Week 2 (Jan. 25 to Jan. 31 ) The Second Law of Thermodynamics	Chapter 3
Week 3 (Feb. 1 to Feb. 7) The Statistical Interpretation of Entropy	Chapter 4
Week 4 (Feb. 8 to Feb.14) Fundamental Equations and Relationships	Chapter 5
<b>Exam I (Feb. 8 to Feb.14)</b>	
Week 6 (Feb. 15 to Feb. 21) Heat Capacity Enthalpy, Entropy and the Third Law of Thermodynamic	Chapter 6
Week 7 (Feb. 22 to Feb. 28) Phase Equilibrium in a One-Component System	Chapter 7
Week 8 (March 1 to March 7) The Behavior of Gases	Chapter 8
Week 9 (March 8 to 14) The Behavior of Solutions	Chapter 9
<b>Spring Break March 14 to March 19</b>	<b>Spring Break</b>
Week 10 (March 22 to March 28) Gibbs Free Energy- Composition and Phase Diagram of Binary Systems	Chapter 10
<b>Midterm Exam, March 22<sup>nd</sup></b>	
Week 11 (March 29 to April 4 ) Reactions and Transformation of Phases	Chapter 11
<b>April 4 Last Day to Drop Class</b>	
Week 12 (April 5 to April 11) Reactions Involving Pure Condensed Phases and a Gaseous Phase	Chapter 12

Week 13 (April 12 to April 18) Reaction Equilibria in Systems Containing Components in Condensed Solution	Chapter 13
Week 14 (April 19 to April 25) Thermodynamics of Phase Transformations	Chapter 15
Week 15 (April 26 to May 3)	Adjustment/Extra Material
<b>Reading Days: May 4 and 5</b>	
<b>Final Exam Period: May 6 to May 12</b>	