MTSC 5000: THERMODYNAMICS OF MATERIALS

FALL Semester, 2019 - 3 credits

Class Instructor   Dr. Srinivasan G. Srivilliputhur, Office: C-136C, Discovery Park.
Email               srinivasan.srivilliputhur@unt.edu; Phone: 940-369-8273
Class Website      Lecture notes, assignments, etc. will be posted on CANVAS.
Lecture            MON/WED 10:00AM – 11:20AM, Discovery Park Room NTDP B158
Office Hours       TUE 2PM-3:00PM/ FRI 10AM-11AM, or by appointment.
TA                 Kishan Jayanand (KishanJayanand@my.unt.edu).

Important Points
1. Class Attendance is Mandatory. Please notify me if you have to miss a class.
2. Disability Statement - If you have a disability requiring an accommodation, please contact both your instructor (me) and UNT Disability Resources and Services (DRS). DRS will determine reasonable accommodations for this course.
3. Academic Integrity – Plagiarism and cheating will result in an F grade (Fail) for that assignment and a referral to the committee handling academic misconduct for further action. Please consult the UNT academic conduct manual for the definition of plagiarism and related policies.
4. How to Study? – I encourage you to discuss thermodynamics principles with your classmates. However, the homework and project you turn in must be your own work. You should not use homework solutions, exams, or other materials from others, and pass it off as your own work.
5. Warning – This is problems based class. While you should help each other understand the problems and the concepts by working in teams, DON’T copy from someone else. Violations of the Academic Integrity code will be punished to the fullest extent.
6. Late Assignment Policy – Homework and other assignments must be turned in before their deadline to avoid losing points. No credit will be given for late submissions unless a prior accommodation has been made with the professor. This year, all students will upload their completed homework assignments and quizzes directly on the CANVAS portal for this class.
7. Makeup Exam Policy – A student missing a scheduled exam due to unavoidable reasons such conference travel, sickness, etc. must show proof such as doctor’s note to the instructor to get permission and/or arrange for a makeup exam.
8. Please do not plan your winter vacation travel before UNT closes. I will not reschedule your final examination.
NOTE

Extra Lectures: I may have extra lectures on Fridays if needed and will announce it in advance.

Homework: Upload your solutions on CANVAS.

Muddle Point Discussions: Muddle points are questions/concepts that confuse you. Every two weeks, each student must upload on CANVAS at least one question of a concept they found hard to understand. In addition, they must contribute to discussing muddle points. There will be about 8 such discussions over the semester.

Exam-1: On October 09, 2019 during your class period.

Exam-2: December 4, 2019. Please do not plan to leave for vacation before your exam.


Course Outline

1. Fundamental concepts and definitions
2. First law of thermodynamics
3. Second law and entropy
4. Statistical interpretation of entropy
5. Free energy and Maxwell’s relations
6. Heat capacity and third law
7. Phase equilibrium in one-component systems
8. Solution thermodynamics
9. Binary and ternary phase equilibria
10. Thermodynamics of point and planar defects
11. Reaction thermodynamics
12. Application of thermodynamics. For example, small systems and electrochemistry

Grading

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Muddle Point Discussions on CANVAS</td>
<td>10%</td>
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<tr>
<td>HW</td>
<td>10%</td>
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<tr>
<td>Two Quizzes Combined</td>
<td>20%</td>
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<tr>
<td>Exam-01</td>
<td>30%</td>
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<td>Exam-02</td>
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Homework Policy

1. **Upload your homework solutions on CANVAS.** The key objective of this course is to enable you to apply thermodynamics principles to materials science problems. Homework exercises play a crucial role for this purpose and are *mandatory*. There will be approximately *six* sets of homework problems over the semester, with about ten problems per set.

2. **Collaborate with your peers.** Homework must be a result of your own effort. However, you are *encouraged* to *discuss* homework problems with your classmates before you work out detailed solutions. I will NOT tolerate cheating.

3. **Presentation must be professional.** The paper size must be 8-1/2" x 11". Write your name (last name first), the homework assignment number, and the due date on the "cover page." You must write only on one side of each sheet, and only inside the margins. Do the problems in the order assigned. **Papers torn out from a spiral notebook are NOT acceptable.** Number the pages in the upper right corner and staple in the upper left corner. BE NEAT! Your career will suffer if your work is sloppy, and you will also lose points in this course.

4. **Use SI Units and appropriate significant digits.** Your answers must include the correct units, unless the calculated quantity is dimensionless! You must round off the final answer appropriately – answers with digits that are not significant will result in a grade reduction.

5. **Grading:** Couple of problems in each assignment set will be randomly selected and graded on a scale of one (lowest) to ten (highest). The remaining problems will be graded for bona fide attempt on a scale of one (lowest) to ten (highest).

6. **Late Submissions will not be accepted.** Exceptions will be made only for documented conference attendances, and significant circumstances such as leave to attend funeral, hospitalization, and/or documented medical appointment.

7. **A Useful Problem Solving Strategy:** You must learn to address thermodynamics problems in a structured manner, thus: (a) **Outline a solution.** Re-phrase the problem in your own words from a materials science perspective, add a sketch if needed. Explicitly state and justify all assumptions you make for solving the problem. List in words the quantities you are given and you need to solve for. Write down the necessary equations. (b) **Execute the solution.** (c) **Evaluate your solution.** Check its units and assess if it is physically reasonable.