Vm235: Thermodynamics
Summer 2016

Lectures: Tues, Thur 14:00–15:40, Dong Xia Yuan 106
Recitation: Wed 18:30–20:00, Location TBD

This syllabus is subject to change at the instructor's discretion, based on class progress and needs.

INSTRUCTOR

- KWEE-YAN TEH, JI Room 206, tehk@sjtu.edu.cn

Office hours: Tues, Thur 15:40–16:40, or by appointment

TEACHING ASSISTANTS

- MA NINGYU, mnylzxt@sjtu.edu.cn, Mon 16:00–17:00, Tues 18:30–19:30
- SAM SHEN LI, good025@sjtu.edu.cn, Mon 10:30–11:30, Wed 20:00–21:00
- SHEN SHIKUN, shenshikun@sjtu.edu.cn, Mon 19:00–20:00, Thur 12:30–13:30

TA consultation in Study Room 228 of the Joint Institute.

COURSE DESCRIPTION

This course provides an introduction to the science and engineering of *energy transformations*, the hardware used to accomplish these transformations, and the constraints—both fundamental and practical—that are encountered during the transformation process.

Specifically, the course covers the following concepts: the First and Second Laws; system and control volume analyses; properties and behavior of pure substances; applications of these concepts to thermodynamic systems operating in steady-state and transient processes, including power-producing cycles and refrigerators; and modes of heat transfer.

COURSE OUTCOMES

Course evaluation in the Joint Institute is based on the IDEA Student Ratings of Instruction survey, which will assess Vm235 teaching effectiveness based on student progress towards the following important and essential learning objectives:

1) *Important:* Gain factual (technical) knowledge about energy transformation
    a) Outcomes: Explain basic concepts (such as system, state, process, and cycle) and properties (such as temperature, pressure, and density) used in thermodynamics
    b) Determine the thermodynamic phase and properties of a pure substance in a given state, using property tables and relations
2) *Essential:* Learn fundamental principles in engineering thermodynamics
    a) Outcomes: Identify an appropriate system, and indicate interactions (work, heat transfer, and/or mass transfer) between the system and surroundings
    b) Given a process or device, compute the corresponding work, heat transfer, and/or mass transfer
3) *Essential:* Learn to *apply* these factual knowledge and fundamental principles to the analyses of energy transformation processes and devices
    a) Outcomes: Analyze the performance of an actual process or device by comparing it to the corresponding (appropriately) idealized process or device
    b) Evaluate the performance of simple power and refrigeration cycles
4) *Important:* Develop a systematic approach to problem solving, and cultivate a critical (technical) understanding of energy issues
    a) Outcome: Understand how energy transformation processes affect the environment.

More about IDEA

The IDEA Student Ratings of Instruction is an **anonymous** online survey administered externally by the non-profit IDEA Center (http://ideaedu.org/services/student-ratings-of-instruction/). The survey is tentatively set for the 11th and 12th weeks of the term, before finals; more details will be forthcoming. Your prompt, thoughtful, and honest feedback through this survey is crucial for me to identify the aspects of Vm235 instruction that are effective and the areas for improvement.

COURSE PREREQUISITES

Freshman chemistry (Vc210: the concepts of mole, molar mass, the ideal gas law) and mathematics (Vv156 or Vv186: elementary calculus, including ordinary differentiation, integration, and partial differentiation). If you cannot meet these requirements, you should drop this course immediately.

COURSE POLICIES

Academic Integrity

All students are bound by the Joint Institute Honor Code. In particular, **the work turned in by each student or student team must be original**. Violations will be reported to the appropriate authorities.

Grading

Your course grade will be the **higher** of the two scores calculated based on the following two schemes.

		Scheme I	Scheme II
Weekly assignments	(individual) due in class on Tuesdays	8%	8%
	(team) presented in class & in written form	8%	8%
Short quizzes	in class on Tuesdays, May 31, Jun 14, Jul 12, and Jul 26	24%	24%
Midterm	in class on Thursday, Jun 23	24%	30%
Final exam	Week 13 (date, time tbd)	36%	30%

Weekly Assignments

Much of what you will learn in this class will be through the homework sets. If you have clarifying questions about them, please pose the questions to the TAs and me via the Sakai discussion forum. All questions and answers will be available for everyone to review. Please do so before firing off your questions, to make sure the questions have not already been posed and answered.

You are also encouraged to discuss approaches to solving the homework problems with other students, which is a legitimate and efficient means to gain understanding of the subject matter. To facilitate such discussions, you will be assigned a set of teammates with whom to solve the problems together, and to present the solution to the rest of the class once during the semester (8% of the course grade).

Nine sets of homework are assigned on Tuesdays and due in class after a week, **at the beginning of class**. The TAs will choose one problem in each homework set to be graded. The lowest of the nine homework scores will not be counted toward your course grade. Each of the remaining eight homework scores counts toward 1% ($\times 8 = 8\%$) of the course grade. Late homework will not be accepted.

Your homework must be written on A4-size paper. Please start each problem on a fresh sheet of paper. Homework that runs to multiple sheets of paper must be stapled. Do not forget to write your name on the top of every page of the homework. Please refer to the homework solution format posted on the course website. (In order to receive full credit for your homework, the quizzes, midterm, and final exam, you would need to follow this solution format, and present your analysis clearly, accurately, in a logical, orderly, and legible manner. In the quizzes and exams, expect significant credit for each problem to be

awarded for (wherever appropriate) a clearly-labeled system sketch, a list of relevant assumptions, and a brief statement of the balance equation(s) used in the analysis.) Several examples have also been posted on the course website for your reference.

In all cases, you are responsible for your own work; to reiterate, **the work turned in by each student or student team must be original**.

Short Quizzes, Midterm and Final Exams

Short quizzes will be given in class periodically during the term. These quizzes are intended to reinforce your knowledge of the materials covered in class, and to encourage class attendance and participation.

Given the nature of the course content, the final exam will be comprehensive, but with emphasis on materials covered after the midterm.

The quizzes and exams are with open book plus one page of your own notes (on a single side of a sheet of A4-size paper).

If you are absent without an excuse when a quiz or exam is assigned, you will **NOT** be able to make up for it.

Textbook

Y. A. Çengel and M. A. Boles, 2011. *Thermodynamics: An Engineering Approach*, 7th ed. in SI units. McGraw-Hill, Singapore (ISBN: 978-007-131111-3).

Recitation Hours

The teaching assistants will conduct weekly recitation sessions during which concepts presented in previous lectures are reviewed, supplementary textbook problems are solved, and other questions are addressed. *Wed 18:30–20:00, location TBD.*

Participation

Attendance in lectures, recitation sessions and office hours is not compulsory, but is strongly recommended. Next to completing (and fully understanding) the homework sets, attending and actively participating in these course functions are the best ways to learn the material.

Common courtesy is expected of everyone in Vm235:

- **Be punctual.** Sauntering into the classroom eight minutes in is distracting as well as disrespectful of your fellow students.
- **Come prepared.** Ask questions, contribute to class discussions, and generally be alert in class.
- **Stay offline.** Please turn off all cellphones, computers, and other electronic devices.
- **Guide to online etiquette.**
  - You are encouraged to pose questions to the TAs and me via the Sakai discussion forum. We will respond to the questions as soon as possible; we will strive for maximum 24-hour turnaround (not applicable to weekends). However, do not expect a prompt response to unreasonable Monday 11:42 PM posts seeking last-minute help on homework that is due the next afternoon.
  - *Read first, write later.* All questions and answers on the Sakai discussion forum will be accessible everyone. Please review the Q&A before firing off your questions, to make sure the questions have not yet been posed and answered.