

## MEC 398 THERMODYNAMICS II

Semester: Spring 2021

Course: MEC 398, Engineering thermodynamics II

### Instructor:

Professor Juldeh Sesay, 226 Heavy Engineering Bldg., (631)632-8493

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Office hours: Mondays and Wednesday: 02:00 – 04:00 PM.

(Either through zoom or over the phone, whichever choice fits your need)

Office Phone: (631)632-8493;

Home Phone: (732)900-5041

Echo360 lecture videos shall be uploaded on blackboard under lecture video folder every Tuesday and Thursday at exactly 03:00 pm.

### Course Description:

The course begins with a brief review of the basic concepts introduced in Thermo I, followed by a discussion of exergy. A large portion of the classes falls into the general topic of thermodynamic cycles, discussing the operating principle of common cycles as well as practical applications. HVAC applications are another major topic, along with the topic of equilibrium thermodynamics and its application to mixture, chemical reaction and combustion.

**Course Prerequisites:** Mass and Heat Transfer (MEC 305)  
Fluid Mechanics I (MEC 364)  
Thermodynamics I (MEC 301)

### Textbook:

Thermodynamics; An Engineering Approach, Ninth Edition by Yunus A. Cengel, Michael A. Boles, Mehmet Kanoglu (McGraw-Hill)

### Reference:

Fundamentals of Engineering Thermodynamics, Eighth Edition by Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey (Wiley)

### Class schedule:

Lectures: Tuesdays and Thursdays: 03:00 PM to 4:20PM (Online)

### Grading and Class Policies:

Final grade is based on your performance in the following areas

Homework: 10%

Quizzes: 10%

Midterm 1: 25% (date to be announced at least a week before)

Midterm 2: 25% (date to be announced at least a week before)

Final: 30% ( May 11, 2021, 2:15pm – 5:00pm)

## **Course Topics**

### **Week 1: Lecture 1: Entropy**

The concept of entropy, the principle of the increase of entropy, Gibbs' development of equilibrium thermodynamics on the basis of the entropy principle

### **Week 2: lecture 2: Exergy**

Gibbs free energy, the concept of exergy, derivation of the exergy equation and reduction of the exergy equation to the Carnot formula on the one hand and Gibbs free energy on the other hand

### **Week 3: Lecture 3: Gas power cycles**

Assumptions, Otto cycle, Diesel cycle, Brayton cycle

### **Week 4: Lecture 4: Vapor power cycle**

Rankine cycle, advanced Rankin cycle, cogeneration

### **Midterm 1: Lectures 1 – 4 (date to be announced)**

### **Week 5: Lecture 5: Heat pump cycle**

Vapor compression heat pump cycle, refrigeration application, the operational issues of heat pump for heating

### **Week 6: Lecture 6: Thermodynamic relations**

Equilibrium thermodynamics, thermodynamic relations

### **Week 7: Lecture 7: Gas mixtures**

Ideal gas mixtures, Dalton's law, Gibbs theorem

### **Midterm 2: Lectures 5 – 7 (date to be announced)**

### **Week 8: Spring Break**

### **Week 9: Lecture 9 : Gas-Vapor mixtures and air conditioning**

Dry and atmosphere air, specific and relative humidity of air, dew point temperature, The psychrometric chart, air conditioning

### **Week 10: Lecture 10: Chemical reactions**

Fuels and combustion, enthalpy of formation and enthalpy of combustion, energy analysis of reacting and adiabatic flame temperature

### **Week 11: lecture 11: Combustion**

quasi-static chemical reaction processes, equilibrium criterion and the equilibrium constant, law of mass action

### **Week 12: Lecture 12: Special topic**

**Final: Lectures 9 – 12 (May 11, 2021, 02:15 – 05:00 pm)**

**Course Policies:**

1. Lecture notes will be posted on the blackboard prior to class.
2. Blackboard will be used for posting lectures, making course announcements, grading, and communicating with the class.
3. Lectures are held on Tuesdays and Thursdays from 03:00PM to 04:20PM
4. No late homework (HW) is accepted and zero grade will be assigned. Each homework will be uploaded on Blackboard under the Assignments folder and consist of four to six problems. Homework must be submitted online through the digital drop box under the Assignments folder. All procedures must be shown in homework's and tests.
5. The first homework page has to have heading; your name, identification number, course & HW number (MEC 398, HW-2, for example)
6. Submitted homework for grading has to be your own work. You have to show all work or give related references. No makeup tests will be given. If you do homework with someone else, you have to understand and stand behind the submitted work on your own. If it is determined that you are not familiar with the homework you may be responsible for plagiarism and cheating, and therefore lose all credits for that homework and all other homework's to follow.
7. There are three exams and will be based directly on homework's and materials covered in class

**Instructor expectation:**

- Be regular in class attendance
- Arrive on time
- Be attentive and participate in classroom discussions
- Come prepared to lectures/recitations
- Be up to date on previously cover material
- Allocate sufficient time every week to study for this course
- Be prepared to work hard and learn

**Pet Peeves:**

- Being distracted or distracting others in class
- Not willing to work hard or put an honest effort into learning
- Coming to me late in the semester for grade changes, extra credit, etc.
- Arguing over partial credit on homework/test grades
- Doing other tasks during lectures (including sleeping)
- Cellular phones ringing during lectures

**Special Needs/Disabilities**

If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact the staff in the Disabled Student Services office (DSS), ECC (Educational Communications Center) Building, Room

128,(631)632- 6748. DSS will review your concerns and determine with you what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

### **Statement on Academic Dishonesty**

“Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work is not originally yours. Examples include, *but are not limited to*, copying or plagiarizing class assignments including homework, reports, design, computer programs, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.”

### **Calculator Policy**

“Effective Spring, 2008 only the following calculators will be permitted to be used on all midterm and final exams in the department of Mechanical Engineering. There will be no exceptions! This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) Exam that many of you will take in your senior year, as well as the professional Engineering (PE) exam that you may take several years now. The sooner you become comfortable on one of these calculators, the better.

NCEES Allowed calculators as of spring, 2008:

- ▶ Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name
  
- ▶ Hewlett Packard: The HP 33s and HP 35s models, but no others.
  
- ▶ Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

The NCEES policy on calculators can be found here: <http://www.ncees.org/exams/calculators/>.”

Students are expected to attend every class, report for examinations and submit major graded coursework as scheduled. If a student is unable to attend lecture(s), report for any exams or complete major graded coursework as scheduled due to extenuating circumstances, the student must contact the instructor as soon as possible. Students may be requested to provide documentation to support their absence and/or may be referred to the Student Support Team for assistance. Students will be provided reasonable accommodations for missed exams, assignments or projects due to significant illness, tragedy or other personal emergencies. In the instance of missed lectures or labs, the student is responsible for review posted PowerPoint slides under the Documents folder and the recorded lecture videos under the Lecture Videos folder Please note, all students must follow Stony Brook, local, state and Centers for Disease

Control and Prevention (CDC) guidelines to reduce the risk of transmission of COVID. For questions or more information click [here](#).