

**MECH 432, Energy Systems  
Course Syllabus  
Spring 2022**

**Mechanical & Mechatronic Engineering  
and Advanced Manufacturing  
CSU, Chico**

**Instructor:** Webster Johnson (“Dr. J.”), Ph.D.,  
Office: OCNL 418, 898-5579, [wjohnson@csuchico.edu](mailto:wjohnson@csuchico.edu)  
Office Hours: TBD (See class page on Bb Learn) or Zoom by appointment

**Classes** Section -01 (Lecture): TuTh: 9:30AM—10:45 AM , Tehama Hall 108  
Section -02, -03, -04 (Labs): WeThFr 2:00 – 4:50 PM, Langdon 122

**Prerequisites:** MECH 338 – Heat Transfer

**Textbook:** The required textbook is same one used in MECH 332, Cengel and Boles. Any of the following editions:

- 8<sup>th</sup> Edition (Digital or Loose-Leaf): (available in bookstore [Link](#) )
- 7<sup>th</sup> Edition (internet sources)
- 6<sup>th</sup> Edition (internet sources)

**Note #1:** The *WileyPlus* bundle is **not** necessary

**Note #2:** textbooks, electronic or hardcopy, are not allowed during exams

**Note #3:** Chap. 18 on Renewable Energy is available in Resources

**Properties Info Software** Thermodynamic property tables and charts are available in Resources in the Bb Learn class site. Excel, Matlab are recommended. EES will be used in the Diesel Lab

**Internet:** Lecture presentations, text problem homework and solutions, design problems, test equation sheets, and other course material are posted on Blackboard Learn.

**Grading:**

Homework Problems	15%
Laboratory Grade	25%
Project	10%
Midterm Exams (3)	30%
Final Exam	20%

**Grade Schema**

A	A-	B+	B	B-	C+	C	C-	D+	F
>=	>=	>=	>=	>=	>=	>=	>=	>=	<
92.48%	90.00	86.67	83.33	80.00	76.67	73.33	70.00	65.00	65.00

**Homework:** There will be approximately 10 homework problem sets assigned during the semester. Problem solutions must be neat, legible, numbered, arranged in assigned order, written on only one side of the white paper, and stapled. Solution analysis must follow a specific methodology,.

Homework is submitted the Bb Learn assignment drop-box for each assignment. Homework is end of the due date. **Late homework is not accepted. Homework submitted by e-mail is not accepted.**

**Design Problem** One-design problems will be assigned that focus on energy systems applications. It is an open-ended problem that requires more creative thought than homework problems. Required report format will be given with the assignment

**Laboratories**

Section -02	Wednesday 2:00 PM—4:50 PM
Section -03	Wednesday, 2:00PM—4:50 PM
Section -04	Thursday, 2:00PM—4:50 PM

See the separate lab syllabus for details.

**Examinations:** There will be 2 75 minute midterm exams and one 2-hour final exam. The midterm exams will be given during the activity session on Tuesday. The midterms will cover the subjects since the previous exam. The final exam is course comprehensive.

**If you know you are going to miss an exam due to illness or other legitimate reason, you must contact me *before* the exam.** Make-up exams are only allowed for pre-arranged, legitimate absences.

**Email:** If you need to contact me outside of class or office hours, please use email. It is expected that all students will monitor their Wildcat email accounts as I will use this system to make important announcements from time to time. You can set up automatic forwarding of your Wildcat email to another preferred email provider at

**Cell Phones:** All alert sounds on your cell phone must be turned off during class. Cell phone use during class is not tolerated, except for emergency situations (911).

## **University Policies and Campus Resources**

### ***Academic Integrity***

Students are expected to be familiar with the University's Academic Integrity Policy. Your own commitment to learning, as evidenced by your enrollment at California State University, Chico, and the University's Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Judicial Affairs. The policy on academic integrity and other resources related to student conduct can be found on the [Student Judicial Affairs web site](#).

### ***IT Support Services (Optional)***

Computer labs for student use are located on the first and fourth floor of the Meriam Library, Room 116 and 450, Tehama Hall Room 131, and the Bell Memorial Union (BMU) basement. You can get help using your computer from IT Support Services; contact them through the [ITSS web site](#). Additional labs may be available to students in your department or college.

### ***Student Services (Optional)***

Student services are designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. Students can find support for services such as skills assessment, individual or group tutorials, subject advising, learning assistance, summer academic preparation and basic skills development. Student services information can be found on the [current students page of the CSU Chico web site](#).

### ***Americans with Disabilities Act***

If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations.

#### ***Accessibility Resource Center***

<http://www.csuchico.edu/arc>

530-898-5959

Student Services Center 170

[arcdept@csuchico.edu](mailto:arcdept@csuchico.edu)

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**[Accessibility Resource Center](#)**

530-898-5959

Student Services Center 170

[arcdept@csuchico.edu](mailto:arcdept@csuchico.edu)***Student Learning Center (Optional)***

The mission of the Student Learning Center (SLC) is to provide services that will assist CSU, Chico students to become independent learners. The SLC prepares and supports students in their college course work by offering a variety of programs and resources to meet student needs. The SLC facilitates the academic transition and retention of students from high schools and community colleges by providing study strategy information, content subject tutoring, and supplemental instruction. The University Writing Center has been combined with the Student Learning Center. You can also visit the [Student Learning Center web site](#).

***Blackboard ALLY***

Chico State is committed to providing you the best learning experience possible. With this goal we have activated Blackboard ALLY in your courses. ALLY is a revolutionary product that focuses on making digital course content more accessible to all students. You will now be able to download any content in this course in the format that fits best with your learning style. PDF, HTML, .EPUB and Audio files are now available for most content items. Here is a link to more [information on formats available](#) as well as what each format offers. Should you have any questions or experience issues while using ALLY please contact the Office of Accessible Technology and Services at [oats@csuchico.edu](mailto:oats@csuchico.edu) or 530-898-6532.

**Catalog  
Description**

Thermodynamics of power cycles, refrigeration, air-conditioning, and combustion processes; analysis, design, and testing of systems involving both conventional and renewable energy sources for power generation, heating, and cooling applications. 3 hours discussion, 3 hours laboratory.

**Course  
Objectives:**

Apply fluids, thermodynamics, heat transfer among other engineering principles to analyze the performance and efficiency of modern power systems. Develop critical thinking and judgment skills to setup, run, and monitor various data acquisition systems including diesel and turbine engines, wind tunnel, photovoltaic and battery storage system, heat exchanger and thermoelectric refrigerator. Become proficient at communicating technical information and experimental results in a lab report. Understand the consequences of using resources for our daily energy needs as an industrialized country and what that means for other countries or other generations and what considerations and/or responsibilities we have to support sustainable practices.

**Specific Course  
Outcomes**

1. Develop an intuition and understanding of energy principles through hands on experimentation, data collection, and analysis.
2. Be able to apply thermodynamics, fluids, and heat transfer principles to analyze and test various energy systems for performance and efficiency. Principles include:
  - a. The First Law of Thermodynamics
  - b. The Second Law of Thermodynamics
  - c. Fourier's Law of heat conduction
  - d. Newton's law of cooling for heat convection
  - e. Bernoulli's principle
  - f. Ideal gas law
3. Prepare written reports that clearly identifies and states the engineering principles observed during laboratory experiments. Use data and sound science and reasoning to interpret and explain results and clearly justify the significance of the findings.
4. Perform limited research on a topic related to energy and suggest possible design solutions based on a thermodynamic analysis.