

The Pennsylvania State University
Summer 2018 Distance Education Online Course

ME 300: ENGINEERING THERMODYNAMICS
Credits: 3; prerequisites: CHEM 110, MATH 141, or equivalent

General: This is a hybrid online/residential course offered during the period of May 14, 2018 through August 3, 2018. Schedule of important milestones is given on the next page. Pre-recorded on-demand **video lectures** will be available for watching online via CANVAS. The lectures were originally presented in a live class in a previous semester, so please ignore any specific references to that semester mentioned in the video lectures. There are **questions embedded** in lectures which will pop up randomly. These must be answered within a short time (typically 30 sec). You will have to login at the beginning of each lecture. Lectures may be paused, restarted, rewind, and watched multiple times. The **mid-term and final exams** will be held on June 28 and August 1, 2018, respectively, and may be taken in designated rooms on campus in person or on Internet via *Examity*. Read important note below regarding use of *Examity*. In addition, **6 quizzes, 7 homework assignments, and 8 Reading/Practice Problems assignments, and one virtual lab** are distributed throughout the term. Some of the work must be completed on the electronic text (eText) site **CONNECT** on Internet and remaining work on **CANVAS** portal depending on the type of assignment. Therefore, access to the eText is absolutely required and must be purchased. It is available at a significantly discounted price compared to the hard copy of the text, and the hard text copy is not required. Details on all these topics are given below. In general, follow the most updated schedule posted on CANVAS for our course in Summer 2018. Assignments in the first week, HW#0, Quiz#0, and Reading Assignment X, are for practice only. **Office hours**, posted on CANVAS, will be held primarily online and in person with prior appointment. The **Summer 2018 Online Course Schedule** is given on the next page and the **Course Topics Outline** is appended at the end.

Important note on the use of *Examity* software for taking the final exam: This course may require you to take exams using certain proctoring software that uses your computer's webcam or other technology to monitor and/or record your activity during exams. The proctoring software may be listening to you, monitoring your computer screen, viewing you and your surroundings, recording and storing any and all activity (including visual and audio recordings) during the proctoring process. By enrolling in this course, you consent to the use of the proctoring software selected by your instructor, including but not limited to any audio and/or visual monitoring which may be recorded. Please contact your instructor with any questions.

Summer 2018 ME 300Online Course Schedule

Week #: starting on	Monday	Tuesday	Wed.	Thursday	Friday	Sat.	Sunday
1: May 14				HW 0 Due	Quiz 0		Rdng/Prob X
Watch Videos*: Course Overview, Introduction to CONNECT, Lectures 1 through 5							
2: May 21		HW 1 Due		Quiz 1			Rdng/Prob A
Watch Videos*: Lectures 6 through 9							
3: May 28		HW 2 Due		Virtual Lab			Rdng/Prob B
Watch Videos*: Lectures 10 through 14							
4: June 4	Catch-up week						
5: June 11		HW 3 Due					Rdng/Prob C
Watch Videos*: Lectures 15 through 18							
6: June 18		HW 4 Due		Quiz 3			Rdng/Prob D
Watch Videos*: Lectures 19 through 23							
7: June 25				Mid-term Exam			Rdng/Prob E
Watch Videos*: Lectures 24 through 27							
8: July 2	Catch-up week						
9: July 9		HW 5 Due		Quiz 4			Rdng/Prob F
Watch Videos*: Lectures 28 through 32							
10: July 16		HW 6 Due		Quiz 5			Rdng/Prob G
Watch Videos*: Lectures 33 through 36							
11: July 23		HW 7 Due		Quiz 6			Rdng/Prob H
Watch Videos*: Lectures 37 through 40							
12: July 30	Final Exam						

Notes:

1. Lecture videos, communication, Lecture notes, miscellaneous handouts -- via CANVAS portal
 2. HW assignments, Quizzes, Reading Assignments (including practice problems)-- via CONNECT portal
 3. Help session via Internet (Skype or Zoom)
 4. Final exam – in person or via Internet through *Examity* (student choice)
 4. Office hours – mostly via Internet (*Skype or Zoom*) or in person by prior appointment
 5. Virtual Labs – via Internet
- ** Watch Videos and answer any pop-up questions embedded in the videos

Objective and Scope :

- A. Appreciate the role of thermodynamics in engineering and society.
- B. Understand the importance of thermodynamic properties and know how to use them.
- C. Understand the First Law of Thermodynamics and know how to use it to solve engineering problems.
- D. Understand the Second Law of Thermodynamics and know how to use it to solve engineering problems.
- E. Apply the First and Second Laws to practical systems, including various engineering devices and cycles.
- F. Develop fundamental engineering problem solving skills.

Course Delivery and Contact Information: Primary communication will be via two portals- (i) the **CANVAS portal** on Penn State site and (ii) the McGraw-Hill's **Connect** site. For more information on:

- **homework and Reading assignments**, contact the class TA (see contact information below).
- **online delivery** or course access difficulties, CANVAS issues, etc, contact Tom Iwinski, e-Learning Specialist, at tmi107@psu.edu
- **Connect or eBook issues**, call or contact tech support at <http://mpss.mhhe.com/> (see details below)
- **course content and topics**, contact instructor Anil K. Kulkarni at akk@psu.edu

Additional information/instructions will be updated on CANVAS occasionally as needed. This is a tentative outline and changes may be announced later.

REQUIRED Text: eBook [redacted] by Y.A. Cengel and J.M. Cimbala ,8th Ed. pub. McGraw-Hill. You must purchase the **eBook** version with the *Connect* software for at least Summer 2018 access. You may purchase a two-term access and/or a loose leaf paper edition for additional cost. More information at the website:

You will be offered free access to CONNECT and the electronic text for the first two weeks in case you are thinking of dropping the class. However, you must complete the purchase after the complimentary period if you plan to continue in the class. You may purchase a loose leaf paper edition or a hardcover edition for additional cost. However, only having a paper or hard cover edition is not sufficient. When registering on CONNECT, use your Penn State email ID, such as abc1234@psu.edu. Do NOT use any other email address (like gmail, hotmail, etc.).

Following is a useful link to a YouTube video on how to use the **eBook** text and the software *Connect*, and I strongly recommend that you watch it before starting the reading assignments:

<https://www.youtube.com/watch?v=auaHNO9A2Es>

CONNECT Help: Students can visit the following link for a chat or other help from their tech team: <http://mpss.mhhe.com/>

Course Schedule: In addition to watching lecture videos and answering the pop-up questions, each week there will be several more items you need to complete from Reading/Practice Problems, homework assignments, quizzes, mid-term and final exams, reading posted handouts and general studying. You will absolutely require access to CANVAS and McGraw-Hill's CONNECT.

Grading Policy:

	<u>Weight (+/- 2%)</u>
Reading Assignments and Practice Problems (from 8 Reading Assignments A through H, one lowest dropped, 2.5% each)	17.5%
Homework sets: 7, with <u>one lowest</u> score dropped (2.5% each)	15%
Virtual Lab report	2.5%
Mid-term Exam	15%
Quizzes (30 min each): 6, <u>one lowest</u> score dropped (4.5 % each)	22.5%
Final Exam (110 min)	25%
Other (participation, embedded questions, TA input, etc)	2.5%

If more than 50% of work is not attempted in any of the individual categories, it can be grounds for F grade. Also see "Make-up Work" policy below.

Approximate cutoffs:

A 92.0 - 100	C+ 77.0 – 79.9
A- 90.0 - 91.9	C 70.0 – 76.9
B+ 87.0 - 89.9	D 60.0 – 69.9
B 83.0 – 86.9	F 59.9 and below
B- 80.0 – 82.9	

The instructor may adjust above scale in the final analysis, but in no case will scores higher than those listed above be required to achieve the stated letter grades. In the past grade cutoffs have been relaxed for the entire class in favor of students, but it may or may not happen this semester!

Video lectures: Pre-recorded on-demand video lectures will be available for watching online via CANVAS for the ongoing week plus at least two following weeks. The lectures were originally presented in a live class in a previous semester, so please ignore any specific references to that semester mentioned in the video lectures. Tentative course schedule is appended at the end of this syllabus. Lectures may be paused, restarted, rewound, and watched in multiple segments and/or multiple times.

Embedded Questions: Students **must log in** before each video lecture and answer any questions embedded in the video that may pop up. Use your Penn State email ID, such as abc1234@psu.edu, to login (you don't need any password). Do NOT use any other email address (like gmail, hotmail, etc.).

Homework: Eight homework sets will be assigned approximately about a week before due date, typically on Tuesdays. HW assignment will need to be turned in on CONNECT if offered on CONNECT or on CANVAS if offered on CANVAS. (Check each week on CANVAS). Discussion and interaction among colleagues for homework problem solving is encouraged, but it will help only if *you* participate actively and contribute substantially. *Therefore, the final work must be yours.* Solutions will be available within a day or so. One lowest homework grade will be dropped. 25% penalty will be assessed per day late until the solutions are posted – no credit will be given after solutions are posted.

Quizzes: Six on-demand quizzes, each 30 minutes long, will be held typically on Thursdays and should be accessed and completed on CONNECT between 5 pm to 11 pm, unless instructed otherwise. One lowest quiz score will be dropped. Make-up quizzes, if arranged and taken before the regularly held quiz, will be offered based on the “Make-up Work” policy below.

Virtual Lab: There will be a virtual labs available online. We will provide you with guidelines to conduct the virtual experiment and prepare the sample lab report. You will need to conduct the experiments, collect data, and upload completed lab reports on CANVAS.

Reading Assignments with Practice Problems: These are indicated for each week. It is your responsibility to familiarize yourself with the text material. You should read the assignments given in the course schedule from the electronic text and complete the practice problems to the best of your ability before due date. Only after you complete the practice problems in an assignment you get a grade for that assignment. These assignments must be completed on CONNECT. Use only your Penn State email ID, such as abc1234@psu.edu, with any password (not necessarily your Penn State access password) to login to CONNECT account.

Mid-Term Exam: Proctored mid-term exam will be held on 28 June 2018. The exam may be taken in person on campus or via Internet using *Examity*. Read the important note regarding *Examity* on the first page. Also see “Make-up Work” policy below.

Final Exam: To be held during last week as scheduled. The exam may be taken in person on campus or via Internet using *Examity*. Read the important note regarding *Examity* on the first page.

Make-up Work: We realize that some students may not be able to turn in assignments in timely manner because there are unavoidable circumstances, such as illness, athletic event-related or work-related travel, family vacation with no Internet access, late registration, computer problems, family emergency, etc. It is for such reasons we have adopted the policy that one lowest grade in each the following categories of assignments will be dropped - homework, quizzes, and Reading Assignments - (see “Grading Policy” above). **First missed quiz or/and first missed HW assignment and/or first Reading Assignment for any reason will be automatically treated as dropped score(s) – therefore, please do not request a make-up for**

first missed assignment. Any additional make-up assignment will be allowed only under extremely unusual circumstances, with proper documentation for the first as well as the subsequent missed instances. Anticipated absences should be reported well before the due date of assignment.

Instructor: Anil K. Kulkarni, 205 Reber Bldg., Tel. (814) 865-7073; email: akk@psu.edu

Office hours: To be posted on CANVAS. If necessary, office hours can also be arranged by prior appointment.

Teaching Assistant: Feiyan Yu, fwy5031@psu.edu

Additional Information: The course structure, syllabus, and schedule will be followed as rigorously as possible, but, there may be occasional changes, which will be announced. If you wish to correspond with the instructor or teaching assistant by email, **it is highly recommended that you send emails via CANVAS. Otherwise, you must include ME 300 (in addition to other wording) in the subject heading,** or else your email message may get lost. With ME 300 in subject field, the message is automatically directed to a folder which we check routinely. You should copy the instructor (Prof. Anil K. Kulkarni at akk@psu.edu) on all course related emails, even if your email is primarily directed to other course staff.

Students with Disabilities: Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. Student Disability Resources (SDR) website provides contact information for every Penn State campus (<http://equity.psu.edu/sdr/disability-coordinator>). For further information, please visit Student Disability Resources website (<http://equity.psu.edu/sdr>).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines (<http://equity.psu.edu/sdr/guidelines>). If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

Academic Integrity (or, "Cheating") Policy: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty

violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Obviously, cheating of any sort will not be tolerated. Anyone caught cheating will be dealt with according to the College of Engineering policy. In general, a first offence will result in a score of zero for the item in question; second item will result in an F course grade.

Counseling and Psychological Services: Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

Counseling and Psychological Services at University Park (CAPS)
<http://studentaffairs.psu.edu/counseling/>: 814-863-0395

Counseling and Psychological Services at Commonwealth Campuses
<http://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses>)

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400

Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

Educational Equity/Report Bias: Consistent with University Policy AD29, students who believe they have experienced or observed a hate crime, an act of intolerance, discrimination, or harassment that occurs at Penn State are urged to report these incidents as outlined on the University's Report Bias webpage <http://equity.psu.edu/reportbias/>.

* Submit a report via the Report Bias webpage (<http://equity.psu.edu/reportbias/>)

* Contact one of the following offices:

University Police Services, University Park: 814-863-1111

Multicultural Resource Center, Diversity Advocate for Students: 814-865-1773

Office of the Vice Provost for Educational Equity: 814-865-5906

Office of the Vice President for Student Affairs: 814-865-0909

Affirmative Action Office: 814-863-0471

Disclaimer: This is a tentative outline; changes may be made and announced as necessary.

Text: eBook *Thermodynamics* by Y.A. Cengel and J.M. Cimbala ,8th Ed. pub. McGraw-Hill. Online access is required.

ME 300 Course Lectures/Topics Summer Schedule

Week	Lecture Notes	Corresponding Text Contents	Class Topic
1	Lecture #1 Lecture #2 Lecture #3 Lecture #4 Lecture #5	Ch. 1, 2, 3	Syllabus Concepts and Definitions Energy Concepts, Equilibrium Pressure, State Principle Properties Thermodynamics properties of pure substances
2	Lecture #6 Lecture #7 Lecture #8 Lecture #9	Ch. 3	Properties of pure substances Properties of Pure Substances Properties of Pure Substances Processes of Pure Substance/ Properties of Gasses
3	Lecture #10 Lecture #11 Lecture #12 Lecture #13 Lecture #14	Ch. 3	Compressibility Conservation of Mass Calorific properties, Liquid and Solid Properties Review Energy analysis, Energy balance of close system
4			
5	Lecture #15 Lecture #16 Lecture #17 Lecture #18	Ch. 4, 5	Moving boundary work, Polytropic process Energy balance of close system First law of Thermodynamics First law of Thermodynamics for Control Volume
6	Lecture #19 Lecture #20 Lecture #21 Lecture #22 Lecture #23	Ch. 5-2, 5-3, 5-4 Ch. 6-1 -> 6-8	Energy analysis of flow systems Energy analysis of steady-flow systems Heat Exchangers, Pumps, Throttles Steady-flow Devices Second Law of Thermodynamics
7	Lecture #24 Lecture #25 Lecture #26 Lecture #27	Ch. 6-9 -> 6-11 Ch. 7-1 -> 7-3	COP of Devices COP of Actual and Ideal Devices Entropy Entropy of pure substances
8			
	Lecture #28 Lecture #29	Ch. 7-4 -> 7-7, 7-9	Entropy of pure substances Tds relations

9	Lecture #30 Lecture #31 Lecture #32	Ch. 7-10 -> 7-13	Isentropic Efficiencies Entropy of Second Law Device Efficiency
10	Lecture #33 Lecture #34 Lecture #35 Lecture #36	Ch. 10-1 -> 10-5	Gas power cycle Gas power cycle Typical coal-fired electricity generating power plant Actual Rankine cycle, Reheat Rankine cycle
11	Lecture #37 Lecture #38 Lecture #39 Lecture #40	Ch. 9-1 -> 9-6, 9-8	Otto cycle, Diesel cycle, Brayton cycle Otto cycle Diesel cycle, Brayton cycle Review
12			