Republic of the Philippines
CEBU TECHNOLOGICAL UNIVERSITY
Province of Cebu
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COURSE SYLLABUS

in
SCI-M 216
(Course Code)

THERMODYNAMICS (LECTURE)
(Descriptive Title)
1st Semester, A.Y. 2021-2022

Department/Area	:	College of Education
Curriculum	:	All programs
Curriculum Year	:	Second Year
No. of Hours/Sem.	:	54 Hours
Credit Unit(s)	:	3
Prerequisite(s)	:	NONE (on the premise that high school physics is mechanics)

Vision of the University	:	A premier multidisciplinary-technological university
Mission of the University	:	The University shall primarily provide advanced professional and technical instruction for special purposes advanced studies in industrial trade, agriculture, fishery, forestry aeronautics and land-based program, arts and sciences, health sciences, information technology and other relevant fields of study. It shall also undertake research and extension services, and provide progressive leadership in its areas of specialization.

Goals of the University : The University shall produce scientifically and technologically oriented human capital equipped with appropriate knowledge, skills, and attitudes. It shall likewise pursue relevant research, strengthen linkages with the industry, community and other institutions and maintain sustainable technology for the preservation of the environment.

Core Values : Commitment, Transparency, Unity, Patriotism, Integrity, Excellence, and Spirituality.

TEACHER EDUCATION PROGRAM OUTCOMES (P.O.)

The graduates of the Teacher Education programs shall be able to:

Specific to BSED Major in Science

PO1 Demonstrate deep understanding of scientific concepts and principles
PO 2 Apply scientific inquiry in teaching and learning
PO 3 Utilize effective science teaching and assessment methods
PO 4 Manifest meaningful and comprehensive pedagogical content knowledge (PCK of the sciences

Course Description : This course deals with the fundamental principle of temperature and heat, thermal properties of matter, laws of thermodynamics and its application (CMO no.75, s 2017).

This interdisciplinary course provides students an integrated coverage of the basic concept and principles of heat and temperature, thermal properties, laws and human implications of these concepts. This involves a holistic approach in dealing with laws of thermodynamics and its application.

Course Learning Outcomes:

CLO 1 Demonstrate an in-depth understanding of the basic concepts of heat and temperature, thermal properties of matter, and thermodynamic laws as well as one's mathematical skills documented in an electronic portfolio.
CLO 2 Apply the laws of thermodynamics in analyzing problems.
CLO 3 Evaluate the progress in understanding the fundamentals of thermodynamics documented in an electronic Portfolio.

Course Content:

INTENDED LEARNING OUTCOMES Time Allocation (hours)	ASSESSMENT TASKS	TEACHING-LEARNING ACTIVITY	CONTENTS	LEARNING RESOURCES REFERENCES	REMARKS
Within the semester, the students are expected to: (1.5 hours) 1.Explain the importance of the course in the field of specialization. 2.State the relevance of the course to the attainment of the VMGO of the University.	Written/oral overview response of the course content and the relevance of the course to the attainment of VMGO of the University.	Self –Introduction Dissemination and discussion of the university VMGO and core values Students' interaction: *Agreement of class rules and policies*	**Introduction of the course** **Vision, Mission, Goals, Objectives and Core Values of the University** **Course Requirements, Grading System, School and class Policies**	YouTube on the CTU VMGO https://bit.ly/2WV1jYo Teacher made powerpoint presentation Course Syllabus CTU handbook	

Week 2 -Asynchronous • Pre-recorded video on temperature & heat with guide questions - Synchronous • Google meet (Q& A) (2 hours) 1. Explain the concept of thermal Equilibrium and what thermometer measure. (3 hours) 2. Mathematically operate the following concepts: (a) Linear & Volume Thermal Expansion, (b) Specific heat problems, (c) Heat problems with phase change	-Create a short clip that shows a household scenario of the following concepts: thermal Equilibrium, Thermal expansions and phase change -Formative Assessment -Solve problems through a problem set Progressive portfolio	• Online Discussion either/or via zoom/ messenger room/Google meet Giving of problem set(s) - Polls, Surveys on messenger Portfolio Development (Note: to realize the CLO)	**1. Temperature and Heat** a. Common temperature scales b. Thermometers and temperature scales c. Gas Thermometers And the kelvin Scale d. Thermal Expansion (Linear and volume) e. Heat and Internal Energy f. Heat and temperature change: Specific Heat Capacity g. Heat and Phase Change: Latent Heat	• The teacher made problem sets (Note: to be uploaded in the LMS) Link(s): https://www.physicsclassroom.com/class/thermalP • Cutnell et al. Physics 11th Ed. • Sears and Zemansky's University Physics with Modern Physics 13th Ed. Retrieved: https://b-ok.asia/book/2713479/341eea	

(3 hours) 1. Describe heat transfer by conduction, convection, and radiation (3 hours) 2. Mathematically operate the following concepts: (a) conduction problems, (b) radiation problems	• Design an improvised Instructional Model on the heat transfer mechanism • Solve problems through a problem set Progressive portfolio	• Simulate heat transfer mechanisms • Interactive –lecture discussion on heat transfer • Virtual session through google meet • Giving of problem set(s) • Games Portfolio Development (Note: to realize the CLO)	**2. The Transfer of Heat** a. Convection b. Conduction c. Radiation	• The teacher made problem sets (Note: to be uploaded in the LMS) • Cutnell et al. Physics 11th Ed. • Sears and Zemansky's University Physics with Modern Physics 13th Ed. Retrieved: https://b-ok.asia/book/2713479/341eea	
PRELIM EXAM (1 hour)					
(3 hours) 1. Discuss Ideal Gas Law and apply the kinetic theory of gases to Ideal gases	Project-Based on Kinetic Molecular Theory of Gases	• Online Discussion either/or via zoom/ messenger room/Google meet • Explore the given simulation and videos through	**3.The Ideal Gas Law and Kinetic Theory** a. Molecular Mass, the the mole, and Avogadro's Number b. The Ideal Gas Law	• Teacher prepared multimedia presentation • The teacher made problem sets (Note: to be uploaded in the LMS) Simulation: https://phet.colorado.edu/sims/html/atomic-interactions/latest/	

2. Calculate Diffusion Problems	Solve problems through a problem set Formative Assessment using Open book	interactive classroom Polls, Surveys on Messenger	c. Kinetic Theory of Gases d. Diffusion	• Nearpod.com • Student-student interaction • For Interaction Potential, Atomic Bonding and Van der Waals Force. Visit, https://phet.colorado.edu/sims/html/atomic-interactions/latest/atomic-interactions_en.html	
(3 hours) 1. Operate problems involving the relationship among absolute pressure, Kelvin temperature, volume, and the number of moles of the gas) (3 hours) 2. Explain in detail the relationship of bulk behavior (including elasticity, density, surface tension, heat capacities, and equations of state) to molecular structure. (3.5 hours) 3.Analyze how added energy affect the kinetic energy, total energy and	Operate the simulation and answer the given question Solve problems through a problem set Progressive portfolio	• Online Discussion either/or via zoom/ messenger room/Google meet • Explore the given simulation and videos through interactive Classroom Portfolio Development (Note: to realize the CLO)	**4.Thermal Properties of Matter** a. Equations of State b. Molecular Properties of Matter c. Heat Capacities d. Molecular Speeds	• The teacher made problem sets (Note: to be uploaded in the LMS) • Videos to be embedded in the interactive Classroom from the molecular theory of gases to Maxwell-Boltzmann, visit: https://www.khanacademy.org/science/physics/thermodynamics	

temperature of a monoatomic gas and solid					
MIDTERM EXAM (1 hour) **Proctored Exam**					
(6.5 hours) 1.Illustrate the different type of thermodynamic system and mathematically operate the following concepts: (a) work done in a thermodynamic system, (b) Internal Energy (6 hours) Use the first Law of thermodynamics to relate heat transfer, work done and internal energy change	• Sketch the PV diagram to the difference among the adiabatic, isochoric, isobaric, and isothermal process. Solve problems through a problem set Progressive portfolio	• Online Discussion either/or via zoom/ messenger room/Google meet • Interactive lecture discussion Portfolio Development (Note: to realize the CLO)	**The First Law of Thermodynamics** a. Thermodynamic Systems b. Work done during volume changes c. paths between thermodynamic state d. Internal Energy and the First Law of thermodynamics e. Kinds of Thermodynamic Processes f. The internal energy of an Ideal Gas g. Heat Capacities of an Ideal Gas h. Adiabatic Process for an ideal Gas	• Law of Thermodynamics videos to be embedded in the interactive Classroom, visit: https://www.khanacademy.org/science/physics/thermodynamics • The teacher made problem sets (Note: to be uploaded in the LMS) • Teacher prepared PowerPoint Presentation Cutnell et al. Physics 11th Ed Sears and Zemansky's University Physics with Modern Physics 13th Ed. Access the pdf Retrieved: • https://b-ok.asia/book/2713479/341eea	

PREFINAL EXAM (1 hour)					
(3 hours) 1. Explain heat engine and refrigerator and how the Second Law of thermodynamics sets limits on the efficiency of heat engine and refrigerator. (6 hours) 2. Mathematically operate the following concepts: (a) efficiency of heat engine, (b) Idealized Carnot cycle (3.5 hours) 3. Analyze thermodynamics processes using the principles of Entropy.	Create a video clip on the application of the 2nd Law of thermo-dynamics specifically observe at home and explain how the heat flows in the system. Solve problems through a problem set Progressive portfolio	• Online Discussion either/or via zoom/ messenger room/Google meet • Giving of problem set(s) • Interactive lecture discussion Final Portfolio Conceptualization (Note: to realize the CLO)	**Second Law of Thermodynamics** a. Direction of Thermodynamic Processes b. Heat Engines c. Internal-Combustion Engines d. Refrigerators e. The Second Law of Thermodynamics f. The Carnot Cycle g. Entropy h. Microscopic interpretation of Entropy	• Zoom Conference • Law of Thermodynamics videos to be embedded in the interactive Classroom, visit: https://www.khanacademy.org/science/physics/thermodynamics • The teacher made problem sets (Note: to be uploaded in the LMS) • PowerPoint Presentation • Cutnell et al. Physics 11th Ed. • Sears and Zemansky's University Physics with Modern Physics 13th Ed. Retrieved: https://b-ok.asia/book/2713479/341eea	

FINAL EXAM (1 hour)					

References : Ansermet, Jean-Philippe, et.al (2019). Principles of Thermodynamics. Cambridge University Press.

Chandra, Sanjeev (2016). An Introduction to Thermodynamics. John Wiley & Sons.

Sekerka, Robert F.(2015). Thermal Physics: Thermodynamics & Statistical Mechanics for Scientists & Engineers. Elsevier.

Course Requirements : Term Examinations, Online Quizzes, Online Presentations, Reflection Papers

Evaluation Procedures : Class Standing – 60% Major Examination - 40% Total 100%

Revision Date : September 3, 2021

Consultation Hours :

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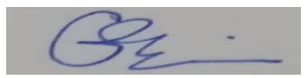
Upon Recommendation of the Curriculum Committee:



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