SYLLABUS THERMODYNAMICS

I. IDENTITY

Faculty	: Mathematics and Natural Sciences
Study Program	: Physics Education
Subject Matter and Code	: Thermodynamics (FIC 325)
Sum SCS	: Theory 3 SCS pract 0 SCS Sum 3 SCS
Semester	: III
Prerequisite Subject Matter	: Introduction to Mechanics, Heat, and Sound
Lecturer (Instructure)	: Rita Prasetyowati

II. DESCRIPTION SUBJECT MATTER

Thermodynamics subject matter generally discuss about relation between Work and Heat, System and specially discuss about Thermodynamics Mathematics, The Zeroth Law of Thermodynamics and Thermometry, Changes of Phase and Clausius-Clapeyron Equation, System and Equation of State of System, Work and The First Law of Thermodynamics, The Second Law of Thermodynamics and Entropy, The Carnot Cycles, Thermodynamics Potentials, The Third Law of Thermodynamics, The Rankine Cycles, Nuclear Energy Electrical Centre, and Heat Transfer.

Actually, the subject matter of Thermodynamics deepen the student knowledge about Calorimetri and Thermometri, which is already studied in subject matter Introduction to Mechanics, Heat and Sound. The concepts of grafics and defferential Integral are deepened and specified to the Thermodynamics Mathematics. This matter has been discussed in subject matter Introduction to Mathematics of Physics.

III. STANDARD COMPETENCE

After studied and understood the Thermodynamics matter in some recommended reference books, students are expected to have a capability in applying the concepts, principles, laws of thermodynamics and energy conservation with its change in heat engine. The students are also expected to have an ability in describing, analyzing and applying the laws of thermodynamics in technology, industry and their everyday life.

IV. THE LECTURE ACTIVITY PLAN

Meeting	The Basic Competence	The Basic Matter	The Lecturer Strategy	Reference
1st and 2nd	Have a capability in applying the Euler condition to determine the total derivative of the thermodynamics property whether it is derivative exact or non exact. Have an understanding to derivate the thermodynamics function and integral the	1. Scope of thermo dynamics 2. Derivatives exact and non exact 3. Integral derivative exact and non exact 4. Conversion graphic p vs V, V vs T, p vs T, and T vs S. 5. Problems 6. The structure task.	1. Lecture 2. Discussion 3. Task	A.1, A.2, B.3, and B.4

	thermodynamics differential. Have an understanding to draw a graphic function of thermodynamics properties.			
3rd	Have an understanding to research the influence of heat to the characteristic changing of thermodynamics properties, present and get the conclusion from the conducted research.	1. Heat Concept 2. Calorimetry 3. Problems 4. The structured task	1. Lecture 2. Presentation 3. Discus	A.1, A.2, B.1, B.2, and B.4
4th	Have a capability in researching the influence of heat to the substance temperature changing, presenting and getting the conclusion from the conducted research.	1. The Temperature Concept and Zeroth law of thermodynamics 2. Thermometry 3. Problems 4. The Structured task	1. Lecture 2. Presentation 3. Discus	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
5th	Have an understanding to research the influence of heat to the substance phase changing, present and get conclusion from the conducted research and have an understanding to describe and apply the Clausius Clapeyron Equation in technology, industry and everyday life.	1. The Changes of Substance Phase 2. The Clausius Clapey ron Equation 3. Problems 4. The Structured Task	1. Lecture 2. Presentation 3. Discus	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
6th	Have a capability to connect the system characteristics with equations of state system and apply these equations in everyday life.	1. Thermodynamics System 2. The System Equations of State 3. Problems 4. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
7th	Have an understanding in describing the connection between heat, internal energy, and an external work of system, applying the first law of Thermodynamics in technology, industry and everyday life.	1. Work 2. The First Law of Thermodynamics 3. Problems 4. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
8th		The First Inserted Examination	Test	
9th	Have an understanding to differentiate of ideal gas and real gas through the equation of state and specific heat capacity	1. Ideal Gas and Equation of States 2. Real Gas and Equation of States 3. Heat Capacity of Ideal Gas and Real Gas	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5

		4. Problems 5. The Structured Task		
10th	Understand to describe the efficiency of the Heat Engine and the coefficient performance of refrigerator and understand to describe the second law of thermodynamics and apply to technology, industry and everyday life.	1. Heat Engine Efficiency 2. Refrigerator Performance Coefficient 3. Formulation of the Second Law of Thermodynamics 4. Problems 5. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
11th	Understand to describe the relation between Carnot cycle and entropy system. Understand to describe and apply the Otto cycle efficiency, Diesel, Stirling, Sargent, and Joule cycles in technology, industry and everyday life.	1. Carnot Cycle and Entropy System 2. Otto, Diesel, Stirling, Sargent, and Joule Cycle Efficiency 3. Problems 4. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
12th	Understand to describe the thermodynamics potential and its relation to Maxwell equation through the magic eight square.	1. The Thermodynamics Potential 2. Maxwell Equation and magic eight square 3. Problems 4. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
13th	Understand to describe and relate the theoretical basics the third law of thermodynamics and the third law of thermodynamics statement.	1. The Theoretical Basics of The Third Law of Thermodynamics 2. The Third Law of Thermodynamics 3. Problems 4. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
14th	Understand to describe and differentiate between Carnot Steam Energy Cycles and Rankine Steam Energy Cycles and also apply it in technology, industry and everyday life.	1. The Basic Concept of The Steam Energy Cycle 2. The Carnot Steam Energy Cycle 3. The Rankine Steam Energy Cycle 4. Problems 5. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
15th	Understand to describe and learn the advantage and the loss of nuclear reactor and capable to apply the Nuclear Energy Electrical concepts in	1. The Basic Concept of Nuclear Reactor 2. The Nuclear Energy Electrical Centre 3. Problems 4. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5

	technology.			
16th	Capable to describe and apply conduction and convection heat transfer concept in technology, industry and everyday life.	1. The conduction heat transfer 2. The convection heat transfer 3. Problems 4. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
17th	Capable to describe and apply the radiation heat transfer concept in technology , industry and everyday life.	1. The Law of Wien Friction 2. The Law of Stefan Boltzmann 3. Rayleigh and Jeans Explanation 4. Planck Postulate 5. Problems 6. The Structured Task	1. Lecture 2. Discuss	A.1, A.2, B.1, B.2, B.3, B.4, and B.5
18th		Second Inserted Examination	Test	

V. REFERENCES

A. REQUIREMENT

1. Sears F.W., 1963, *An Introduction to Thermodynamics, The Kinetic Theory of Gases, and Statistical Mechanics*, First Printed, Reading: Addisson Wesley Publishing Company
2. Zemansky M.W., and R.H. Dittman, 1982, *Heat and Thermodynamics*, Sixth Edition, London: Mc Graw-Hill Book Company.
3. Ahmad Abu Hamid, 2007, *Kalor dan Termodinamika*, Diktat Kuliah, Yogyakarta: Jurusan Pendidikan Fisika FMIPA UNY.

B. SUGGESTION / RECOMMENDATION

1. B. Darmawan, 1990, *Termodinamika*, Diktat Kuliah, Bandung: Jurusan Fisika FMIPA ITB
2. Budi Purwanto, 2009, ***Teori Soal dan Penyelesaian Termodinamika***, Yogyakarta, Jurdik Fisika, FMIPA UNY.
3. Holman J.P., 1988, *Thermodynamics*, Fourt Edition, New York: Mc Graw- Hill Book Company
4. Sears F.W., 1963, *An Introduction to Thermodynamics, The Kinetic Theory of Gases, and Statistical Mechanics*, First Printed, Reading: Addisson Wesley Publishing Company
5. The Physics Coaching Class University of Science and Technology of China, 1990, *Problem and Solution on Thermodynamics and Statistical Mechanics*, Edited By: Yung Kuo Lim, Singapore: World Scientific.

VI. EVALUATION

No	Component	Heavy (%)
1	Lecture Participation	20
2	The Tasks	40
3	The Inserted Examination	20
4	The End Examination	20
	Sum	100

VII. THE LECTURE STRATEGY

No	Face to face	Non face to face
1	Lecture	Read reference books
2	Presentation	Download internet, reference
3	Discuss	Make resume

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Understand

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