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

II. DESCRIPTION SUBJECT MATTER

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

<table>
<thead>
<tr>
<th>Meeting</th>
<th>The Basic Competence</th>
<th>The Basic Matter</th>
<th>The Lecturer Strategy</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st and 2nd</td>
<td>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</td>
<td>1. Scope of thermodynamics&lt;br&gt;2. Derivatives exact and non exact&lt;br&gt;3. Integral derivative exact and non exact&lt;br&gt;4. Conversion graphic p vs V, V vs T, p vs T, and T vs S.&lt;br&gt;5. Problems&lt;br&gt;6. The structure task.</td>
<td>1. Lecture&lt;br&gt;2. Discussion&lt;br&gt;3. Task</td>
<td>A.1, A.2, B.3, and B.4</td>
</tr>
<tr>
<td>Week</td>
<td>Task Description</td>
<td>Topics</td>
<td>Activities</td>
<td>Materials</td>
</tr>
<tr>
<td>------</td>
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| 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. Discuss | A.1, A.2, B.1, B.2, B.4 and B.5 |
| 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. Discuss | 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 Clapeyron Equation  
3. Problems  
4. The Structured Task | 1. Lecture  
2. Presentation  
3. Discuss | 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 |
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Discuss</th>
<th>Problems</th>
<th>Structured Task</th>
<th>Task</th>
</tr>
</thead>
</table>
| 10th  | 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 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. 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 |
### V. REFERENCES

**A. REQUIREMENT**


**B. SUGGESTION / RECOMMENDATION**


### VI. EVALUATION
<table>
<thead>
<tr>
<th>No</th>
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<tbody>
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<td>1</td>
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<td>20</td>
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<tr>
<td>2</td>
<td>The Tasks</td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
<td>The End Examination</td>
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VII. THE LECTURE STRATEGY

<table>
<thead>
<tr>
<th>No</th>
<th>Face to face</th>
<th>Non face to face</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecture</td>
<td>Read reference books</td>
</tr>
<tr>
<td>2</td>
<td>Presentation</td>
<td>Download internet, reference</td>
</tr>
<tr>
<td>3</td>
<td>Discuss</td>
<td>Make resume</td>
</tr>
</tbody>
</table>

Yogyakarta, August 2011

Understand

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