YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 1

FRM/FMIPA/063-00
1 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence : Students understand the technical measurement, vector, and its application**
6. **Indicator :**
   a. **Students can measure the quantities of mass, length, and time**
   b. **Students can operate vectors in phisics**
7. **Essential Concepts : International syistem; significan figure; measuring instrument, units conversion; scalar and vector quantities; forces and vectors, vector resultante, vector operations**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" What is the difference of scalar and vector quantities?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	125 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.					
Follow up	The lecturer give assignment to the student to look for the application measurement in the daily life.	10 minutes				

9. Assessment

(Instrument test)

Yogyakarta, 24 Agustus 2010

Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 2

FRM/FMIPA/063-00
1 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand the translation equilibrium and its application
6. **Indicator :**
   a. **Students can apply the Newton's law of motion in physical problem.**
   b. **Students can identify the impact of friction.**
7. **Essential Concepts : Newton's first law; Newton's second law, Newton's third law; equilibrium; free body diagram; friction.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" why the pasenngers in buss will move backward when the buss accelerated?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of the Newton's law of motion in the daily life.	5 minutes				

9. Assessment

(Instrument test)

Yogyakarta, 24 Agustus 2010

Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 3

FRM/FMIPA/063-00
2 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand torque, rotational equilibrium and its application
6. **Indicator :**
   a. **Students can apply torque in the rotational equilibrium in physical problem.**
   b. **Students can identify the aplication of torque.**
7. **Essential Concepts : Conditions for equilibrium; the moment arm; torque; resultant torque; equilibrium; center of gravity**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Do you know the difference of force and torque?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	120 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of torque in the daily life.	5 minutes				

9. Assessment

(Instrument test)

Yogyakarta, 24 Agustus 2010

Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 4

FRM/FMIPA/063-00
3 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand uniform acceleration and its application in physics problem.
6. **Indicator :**
   a. **Students can apply the equations of the uniform acceleration in physical problem.**
   b. **Students can the projectile motion equation in physical problem.**
7. **Essential Concepts : Speed, velocity; acceleration; sign convention in acceleration; free falling bodies, projectile motion; trajectory**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Do you know the path of the ball which kicked with an elevation angle?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

	which find the difficulties.					
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of the projectile motion in the daily life.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 5

FRM/FMIPA/063-00
4 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand Newton's second law and its application in physics problem.
6. **Indicator :**
   a. **Students can apply Newton's second law in physical problem.**
   b. **Students can differ mass and weight.**
7. **Essential Concepts : Newton's second law of motion; relation between mass and weight; application of Newton's second law to single body problem.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" What is the effect of force to the motion of the body?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of the Newton's second law in single body in the daily life.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 6

FRM/FMIPA/063-00
5 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand concepts of work, energy, power and its application in physics problem.
6. **Indicator :**
   a. **Students can apply the pysical equation of work in physical problem.**
   c. **Students can apply the physical equation of power in the daily life.**
7. **Essential Concepts : Newton's second law of motion; relation between mass and weight; application of Newton's second law to single body problem.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" What is the effect of force to the motion of the body?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of works, energy, and power in the daily life.	5 minutes				

9. Assessment

(Instrument test)

Yogyakarta, 24 Agustus 2010

Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 7

FRM/FMIPA/063-00
6 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand concepts impulse, momentum and its application in physics problem.
6. **Indicator :**
   a. **Students can apply the conservation of momentum in physical problem.**
   b. **Students can identify the physical phenomenon which related the momentum and impulse in the daily life.**
7. **Essential Concepts : Impulse; momentum; the law of conservation of momentum, elastic impact, inelastic impact.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" What happens when the big truct in high velocity collides the small car in rest condition?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

	discussion processes. • The lecture helps the group which find the difficulties.					
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the differennce of elastic and inelastic impact and its example.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 8

FRM/FMIPA/063-00
7 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand uniform circular motion and its application in physics problem.
6. **Indicator :**
   a. **Students can apply the equation of circular in physical problem.**
   b. **Students can identify the physical phenomenon which related the circular motion in the daily life.**
7. **Essential Concepts : Motion in circular path; centripetal acceleration; centripetal force; conical pendulum; motion in vertical circle; satellites in circular orbits; Keppler's law.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Why the planets can orbit the sun?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group	120 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

	which find the difficulties.					
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of circular motion in atoms and planets.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 9

FRM/FMIPA/063-00
8 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand rotational of rigid bodies and its application in physics problem.
6. **Indicator :**
   a. **Students can apply the angular velocity and angular acceleration in physical problem.**
   b. **Students can apply the Newton's second law in the rotational motion.**
7. **Essential Concepts : Anguler displacement; angular velocity; angular acceleration; relationship between rotational and linear motion; rotational kinetic energy; moment of inertia; the second law of motion and rotation; rotational work and power; angular momentum; conservation of angular momentum.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" What is the difference between linear and rotational motion?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline,

	problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.					curious
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application the Newton's second law of motion in the circular motion.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 10

FRM/FMIPA/063-00
9 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand concept of elasticity and its application in physics problem.
6. **Indicator :**
   a. **Students can differ the Young modulus, shear modulus, and Bulk modulus.**
   b. **Students can identify the elastic properties of matter.**
7. **Essential Concepts : Elastic properties of matter; Young modulus; shear modulus; volume elasticity; Bulk modulus; other physical properties of metals.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Is the wood an elastic matter ?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	120 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of elasticity in the daily life.	5 minutes				

9. Assessment

(Instrument test)

Yogyakarta, 24 Agustus 2010

Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 11

FRM/FMIPA/063-00
10 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand fluids and its application in physics problem.
6. **Indicator :**
   a. **Students can apply Archimedes's principle in physical problem.**
   b. **Students can apply Bernoulli equation in physical problem.**
7. **Essential Concepts : Density; pressure; fluid pressure; measuring pressure; the hydraulic pressure; Archimedes's Principle; fuid flow; pressure and velocity; Bernoulli's equation; application of Bernoulli's equation.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Why the airoplane can fly upward in the sky ?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	120 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of Archimedes's Principle and Bernoulli's equation in the daily life.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 12

FRM/FMIPA/063-00
11 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand temperature, expansion and its application in physics problem.
6. **Indicator :**
   a. **Students can measure temperature of the bodies.**
   b. **Students can apply linear, area, and volume expansion in physical problem.**
7. **Essential Concepts : Temperature and thermal energy; the measurement of temperature; the gas thermometer; the absolute temperature scale; linear expansion; area expansion; volume expansion; the unusual expansion of water.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Why the tire of bycicle would be hard after the bycicle used in the long trip?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group.	120 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

	• The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.					
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of expansion in the daily life.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 13

FRM/FMIPA/063-00
12 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand transfer of heat and its application in physics problem.
6. **Indicator :**
   a. **Students can distinguish conduction, convection, and radiation.**
   b. **Students can apply methode of heat transfer in physical problem.**
7. **Essential Concepts : methode of heat transfer; conduction; convection; radiation.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Why the heat of the sun can reach the earth without medium?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group which find the difficulties.	120 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of the methode of heat transfer in the daily life.	5 minutes				

9. Assessment

(Instrument test)

Yogyakarta, 24 Agustus 2010

Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 14

FRM/FMIPA/063-00
13 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand thermal properties of matter and its application in physics problem.
6. **Indicator :**
   a. **Students can use Boyle's law; Charles's law, Gay-Lussac's law; and general gas law and its application in physical problem.**
   b. **Students can distinguish between vaporation and liquifaction.**
7. **Essential Concepts : Ideal gasses; Boyle's law; Charles's law; Gay-Lussac's law; General Gas Law; molecular mass and the mole; the ideal gas law; liquifaction of gas; vaporization; vapor pressure; triple point; humidity.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Is the vaporation only occurred in temperature of 100 ^{o}C?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

	discussion processes. • The lecture helps the group which find the difficulties.					
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of liquifaction of gas; vaporization; vapor pressure in the daily life.	5 minutes				

9. Assessment

(Instrument test)

Yogyakarta, 24 Agustus 2010

Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 15

FRM/FMIPA/063-00
14 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand thermodynamics and its application in physics problem.
6. **Indicator :**
   a. **Students can use the first and the second law of thermodynamics and its application in physical problem.**
   b. **Students can distinguish isobaric, adiabatic, isochoric and isothermal processes.**
7. **Essential Concepts : Heat and work; the internal energy function; the first law of thermodynamics; isobaric processes and the P-V diagram; adiabatic processes; isochoric processes; isothermal processes; the second law of thermodynamics.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Is heat can do the work?" • The lecturer presents the goals of instruction.	15 minutes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the	120 minutes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

	discussion processes. • The lecture helps the group which find the difficulties.					
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of the first and the second law of thermodynamics in the daily life.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.

YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES

LESSON PLAN 16

FRM/FMIPA/063-00
15 April 2010

1. **Faculty/Study Program : FMIPA/Physics Education**
2. **Course / Code : Introduction to Mechanics Heat and Sound**
3. **Credit : Theory: 3 SKS Practice: 0**
4. **Semester/Time : Sem: 1 Time: 150 minutes**
5. **Basic Competence :**
   Students understand sound and its application in physics problem.
6. **Indicator :**
   a. **Students can conduct the experiment of vibrating air column.**
   b. **Students can use of resonannance in physical problem.**
   c. **Students can apply the Doppler's effect in physical problem.**
7. **Essential Concepts : Production of a sound wave; the speed of sound; vibrating air columns; forced vibration and resonnance, audible sound wave; pitch and quality; interference and beats; the Doppler effect.**
8. **Learning Activity**

Compo-nent	Detail Activity	Time	Method	Media	Referrence	Character
Opening	• The lecturer gives apperception by question:" Why the pitch of sirine of ambulance which moving close to us is heard high?" • The lecturer presents the goals of instruction.	15 minu tes	Ask and answer		Text Book	Creative; Critical thinking
Main	• The students make groups; each group consist of 4 students. • The lecturer gives work sheets to each group. • The students discuss the problem in group. • The lecturer manages the discussion processes. • The lecture helps the group	120 minu tes	Discus-sion	Work-sheets	Text Book	Responsible, thinking logically, creatively, inovatively, dicipline, curious

	which find the difficulties.					
Closure	• The students conclude theresult of discussion. • The lecture give formative test.	10 minutes				
Follow up	The lecturer give assignment to the student to look for the application of Doppler effect in the daily life.	5 minutes				

9. Assessment
(Instrument test)

Yogyakarta, 24 Agustus 2010
Lecturer

Yusman Wiyatmo, M.Si.