Department of Physics Education
Faculty of Mathematics and Science Education
Indonesia University of Education

Syllabus

Course	**Fundamentals of Physics I**			Code		**FIS 501**	
Lecturer Name	***Drs. Saeful Karim,M.Si***						
Semester	1	Credit	4	Day of Week	2	Hour	5
Student to attend	550			Classroom			8
Pre-requisites	None						
Compulsory/elective/others				Compulsory			
Common/Fundamental/Special/Others				Fundamental			
Course Objectives	This course is intended to give basic understanding of essential principles of mechanics and thermodynamics for solving various problems of fundamental physics through either comprehension of theory or simple physics experiment. This course, also, as a root to learn physics in advance.						
Course description	The content covers measurement and uncertainty, describing motion (kinematics of particle), Newton's first, second, and third laws of motion, work and energy, linear momentum, rotational motion, bodies in equilibrium (elasticity and fracture), gravitation, fluids, temperature and kinetic theory, heat, and the laws of thermodynamics.						
Compulsory textbook	1) Paul A Tipler.1991. ***Physics for Scientits and Engineers***, Third Edition, Worth Publisher,inc. Translated in Indonesian Language by Lea Prasetio and Rahmad W Adi.1998. ***Fisika untuk Sains dan Teknik***, Edisi ketiga, Jilid I, Erlangga, Jakarta. 2) Douglas C.Giancoli.1998. ***Physics (Principles With Applications)***, Fifth Edition, Prentice-Hall International, Inc. Translated in Indonesian Language by Yuhilza Hanum.2001. ***Fisika***, Edisi Pertama, Jilid I, Erlangga.						
Reference books	3) David Halliday and Robert Resnick.1978. ***Physics***. Third Edition, John Wiley & Sons,Inc. Translated in Indonesian Language by Pantur Silaban & Erwin Sucipto.1985. ***Fisika***, Edisi kelima, Jilid I, Erlangga, Jakarta.						
Teaching Materials/Teaching Aids	• OHT • Physics Demonstration Apparatus						

Evaluation Method	Achievement of students for completed this course is based upon series of test, special task, including the result of experiments which is integrated in each topic.
Request to Student	Write experiment reports

Week	Schedule	Activities	References
1st	***Introduction***: Physics and its relation to other fields, Models, theories, and laws, Physical quantities, standards, and units, the International system of units, changing units, measurement and uncertainty, and significant figures and order of magnitude.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.1-19 Ref 2:p.1-21 Ref 3:p.1-19
2nd	***Describing Motion*** (Kinematics in One Dimension): Reference frames and coordinate systems, Speed, displacement, average velocity, instantaneous velocity, acceleration, one dimensional motion-variable velocity, one dimensional motion-variable acceleration, one dimensional motion-constan acceleration, freely falling bodies, and graphical analysis of linear motion.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.22-52 Ref 2:p.22-55 Ref 3:p.43-74
3rd	***Kinematics in Two or Three Dimensions (Vectors)***: Vectors and scalars, additional vectors-graphical methods, substraction of vectors, multiplication of a vector by a scalar, Analytic method for adding vectors, relative velocity, projectile motion, uniform circular motion, and tangential acceleration in circular motion.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.53-86 Ref 2:p.56-89 Ref 3:p.75-104
4th	***Motion and Force (Dynamics-I)***: Newton's first law of motion, Force, mass, Newton's second law of motion, Newton's third law of motion, weight-the force of gravity and the normal force, free body diagrams, and some applications of Newton's law of motion.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.87-121 Ref 2:p.90-131 Ref 3:p.105-141
5th	***Motion and Force (Dynamics-II)***: Frictional forces, the dynamics of uniform circular motion, and classification of forces; inertial forces, nonuniform circular motion, and centrifugation	Lecture, discussion, demonstration, and exercise.	Ref 1:p.122-154 Ref 2:p.113-171 Ref 3:p.142-172

6th	**EXAMINATION-1**		
7th	***Work and Energy***: Kinetic Energy, work, work and kinetic energy, work done by weight, work done by a variable force, work done by a spring force, power, kinetic energy at high speeds, potential energy, path independence of conservative forces, conservation of mechanical energy, work done by nonconservative forces, conservation of energy.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.155-209 Ref 2:p.172-212 Ref 3:p.173-239
8th and 9th	***Systems of Particles and Conservation of Linear Momentum*** : The center of mass, Newton's second law for a system of particles, linear momentum, linear momentum of a system of particles, conservation of linear momentum, collisions and impulse, conservation of energy and momentum in collisions, elastic collisions in one dimension inelastic collisions in one dimension, collisions in two dimensions, systems with varying mass (a rocket).	Lecture, discussion, demonstration, and exercise.	Ref 1:p.210-260 Ref 2:p.213-246 Ref 3:p.237-314
10th	***Rotational Motion*** : The rotational variables, rotation with constant angular acceleration, relating the linear and angular variables, kinetic energy of rotation, calculating the rotational inertia, torque, Newton's second law for rotation, Angular momentum and its conservation, rolling, inertial reference frame and noninertial reference frame, the coriolis force.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.261-316 Ref 2:p.247-283 Ref 3:p.315-414
11th	***Bodies in Equilibrium (Elasticity and Fracture)*** : Statics-the study of forces in equilibrium, the conditions for equilibrium, the center of gravity, some examples of static equilibrium, stability and balance, elasticity (stress and strain), fracture.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.317-339 Ref 2:p.284-323 Ref 3:p.415-441
12th	**EXAMINATION-2**		
13th	***Gravitation***: Newton's law of universal gravitation, gravity near the earth's surface, gravitational potential energy, satellites and weightlessness, Kepler's law and Newton's synthesis, Einstein	Lecture, discussion, demonstration, and exercise.	Ref 1:p.340-382 Ref 2:p.146-171 Ref 3:p.495-552

	and gravitation.		
14th and 15th	***Fluids Statics and Dynamics*** : Density and specific gravity, pressure in fluids, atmospheric pressure and gauge pressure, Pascal's principle, measurement of pressure, buoyancy and Archimedes' principle, viscosity, surface tension and capillarity, ideal fluids in motion (flow rate and the equation of continuity), Bernoulli's equation, applications of Bernoulli's principle.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.383-422 Ref 2:p.324-363 Ref 3:p.553-608
16th	***Temperature, Heat, and The First Law of Thermodynamics*** : Thermodynamics, the zeroth law of thermodynamics, measuring temperature (the triple point water and the constant volume gas thermometer), the Celcius and Fahrenheit scales, thermal expansion, the ideal gas law, kinetic theory and the molecular interpretaion of temperature, temperature and heat, heat capacity, the first law of thermodynamics, heat transfer mechanisms.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.560-650 Ref 2:p.446-517 Ref 3:p.694-824
17th	***Entropy and The Second Law of Thermodynamics*** : The second law of thermodynamics-introduction, heat engines, refigerators, air conditioners and heat pump, entropy and the second law of thermodynamics, order to disorder, statictical interpretation of entropy and the second law.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.597-687 Ref 2:p.526-556 Ref 3:p.825-865
18th	**EXAMINATION –3**		