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

Syllabus

Course	**Fundamentals of Physics II**			Code		**FIS 502**	
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 foundation understanding basic principles of electricity, magnetism, vibration and wave, and modern physics to solve various simple problems through either comprehension of theory or simple physics experiment. This course, also, as a root to learn physics in advance.						
Course description	Scope of discussion includes : Electric charge and electric field, Gauss' law, electric potential and electric energy (capacitance), electric currents and resistance, DC circuits and instruments, magnetic field, electromagnetic induction and Faraday's law, vibrations and wave, electromagnetic oscillations and alternating Current (AC), electromagnetic waves, special theory of relativity, and early quantum theory and models of the atom						

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 II**, 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 II**, Erlangga. 3) 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. 4) 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	5) 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 II**, Erlangga, Jakarta. 6) 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 and 2nd	***Electric Charge and Electric Field*** : Static electricity (electric chrage and its coservation), electric charge in the atom, insulators and conductors, induced chrage (the electroscope), Coulomb's law, the electric field, field line, electric fields and conductors.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.3-43 Ref 2:p.1-31 Ref 5:p.3-59
3rd	***Gauss' Law***: A new look at Coulomb's law, flux of an electric field, Gauss' law, Gauss' law and Coulomb's law, charged isolated conductor, applying Gauss' law (cylindrical symmetry, planar symmetry, spherical symmetry).	Lecture, discussion, demonstration, and exercise.	Ref 1:p.44-72 Ref 5:p.60-94
4th	***Electric Potential and Electric Energy (Capacitance)***: Electric potential and potential difference, relation between electric potential and electric field, equipotential surfaces, the electron volt as a unit of energy, electric potential due to single point charges, electric potential due to a continuous chrage distribution, electric dipoles, electric potential due to a group of poit charges, electric potential due to an electric dipole, electric potential energy of a system of point charges, potential of a charged conductor, capacitance, dielectrics, dielectrics and Gauss' law, storage of electric energy, thermionic emission and the cathode-ray tube.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.73-136 Ref 2:p.32-60 Ref 5:p.95-181
5th	***Electric Currents and Resistance***: moving charges and electric current, electric current, current density, resistance and resistivity, calculating resisitance from resisitivity, Ohm's law, a microscopic view of Ohm's law, power in electric circuits, semiconductors, and superconductors.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.137-172 Ref 2:p.61-93 Ref 5:p.182-211
6th	***DC Circuits and Instruments*** : DC Circuits and Instruments : Resistors in series and in parallel, EMF and terminal voltage, Kirchoff's rules, solving problems with Kirchoff's rules, EMFs in series and in parallel (charging a battery), circuits containing capacitors	Lecture, discussion, demonstration, and exercise.	Ref 1:p.173-208 Ref 2:p.94-131 Ref 5:p.212-249

	in series and in parallel, circuits containing a resisitor and a capacitor, DC ammeters and voltmeters, and coorecting for meter reisitance.		
7th	**EXAMINATION-1**		
8th	***Magnetism*** : Magnets and magnetic fields, electric currents produce magnetism, force on an electric current in a magnetic field (definition of **B**), force on an electric charge moving in a magnetic field, magnetic field due to a straight wire (force between two parallel wires), operational definition of the ampere and coulomb, Ampere's law, torque on a current loop (magnetic dipole moment), applications (galvanometers, motors, loudspeakers), the Hall effect, and mass spectrometer,	Lecture, discussion, demonstration, and exercise.	Ref 1:p.209-277 Ref 2:p.132-156 Ref 5:p.250-337
9th and 10th	***Electromagnetic Induction and Faraday's Law***: Induced EMF, Faraday's law of induction (Lenz's law), EMF induced in a moving conductor, changing magnetic flux produces an electric field, electric generators, counter EMF and torque (eddy current), transformers (transmision of power), applications of induction (magnetic microphone, tape recording, computer memory, and the seismograph), inductance, energy stored in a magnetic field, ferromagnetism (domains), electromegnets and solenoids, and magnetic fields in magnetic materials (hysteresis).	Lecture, discussion, demonstration, and exercise.	Ref 1:p.279-346 Ref 1:p.162-171 Ref 2:p.156-162 Ref 2:p.172-194 Ref 5:p.338-408 Ref 5:p.409-454 Ref 5:p.503-515
11th and 12th	***Vibration and Waves***: Simple harmonic motion, energy in the simple harmonic oscillator, vertical sping derivations, the reference circle (the period and sinusoidal nature of SHM), the simple pendulum, damped harmonic motion, forced vibration (resonance), wave motion, types of waves, energy transported by waves, reflection and interference of waves, standing waves (resonance), and refraction and diffraction.	Lecture, discussion, demonstration, and exercise.	Ref 3:p.425-557 Ref 4:p.364-445 Ref 6:p.609-655

13th	**EXAMINATION-2**		
14th	***Electromagnetic Oscillations and Alternating Current (AC)***: LC oscillations (qualitatively), the electrical- mechanical analogy, LC oscillations (quantitatively), damped oscillations in an RLC circuit, Alternating Current (AC), three simple circuits, the series RLC circuits, power in alternating current circuits.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.347-395 Ref 2:p.194-216 Ref 5:p.455-503
15th	***Electromagnetic Waves*** : Changing electric fields produce magnetic field (Maxwell equations), Maxwell's fourth equation (displacement current), production of electromagnetic waves, calculation of the speed of electromagnetic waves, light as an electromagnetic spectrum, energy in EM waves, and radio and television.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.397-429 Ref 2:p.215-241 Ref 5:p.516-576
16th	***Special Theory of Relativity***: Galilean-Newtonian relativity, the Michelson-Morley experiment, postulates of the special theory of relativity, simultaneity, time dilation and the twin paradox, length contraction, four-dimensional space-time, mass increase, the ultimate speed, $E=mc^2$ (mass and energy) relativistic addition of velocities, and the impact of special relativity.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.582-632 Ref 5:p.912-921
17th	***Early Quantum Theory and Models of The Atom*** : Discovery and properties of the electron, planck's quantum hypotesis, photon theory of light and the photoelectric effect, photon interaction (Compton effect and pair production), wave-particle duality (the principle of complementarity), wave nature of matter, electron microscopes, early models of the atom, atomic spectra (key to the structure of the atom), the Bohr model, and the Broglie's hypothesis.	Lecture, discussion, demonstration, and exercise.	Ref 1:p.633-663 Ref 5:p.833-895
18th	**EXAMINATION –3**		