



**INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)**  
**FAKULTAS TEKNOLOGI ELEKTRO DAN INFORMATIKA CERDAS**  
**DEPARTEMEN TEKNIK ELEKTRO**  
**Program Studi Sarjana (S1) Teknik Elektro**

**INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)**  
**FACULTY OF INTELLIGENT ELECTRICAL & INFORMATICS TECHNOLOGY**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**  
**Bachelor Degree Program in Electrical Engineering**

**1** Nama Mata Kuliah : Fisika 1 / *Physics 1*  
*/ Course Name*

**2** Kode Mata Kuliah : SF234101  
*/ Course Code*

**3** Kredit / *Credits* : 5 SKS

**4** Semester / *Semester* : 1

#### **Deskripsi Mata Kuliah / *Course Description***

Pada mata kuliah ini mahasiswa akan belajar memahami hukum-hukum dasar fisika, Kinematika partikel, Dinamika partikel, Kerja dan energi, Gerak rotasi, Getaran, Mekanika fluida, Termometri dan Kalorimetri, Perpindahan panas, Termodinamika melalui uraian matematika sederhana serta memperkenalkan contoh pemakaian konsep, dan melakukan analisa materi dalam bentuk praktikum. / *In this course students will learn to understand the basic laws of physics, particle kinematics, particle dynamics, work and energy, rotational motion, vibration, fluid mechanics, thermometry and calorimetry, heat transfer, thermodynamics through simple mathematical descriptions and introduce examples of the use of concepts, and analyze the material in the form of practicum.*

#### **Capaian Pembelajaran Lulusan (CPL) Yang Dibebankan Mata Kuliah / *Program Learning Outcomes Charged to The Course***

CPL 1 Mampu menerapkan Ilmu Pengetahuan Alam dan Matematika pada bidang Teknik Elektro / *Able to apply Natural Sciences and Mathematics in the field of Electrical Engineering.*

CPL 3 Mampu merancang dan melaksanakan eksperimen laboratorium dan/atau lapangan, menganalisa dan menginterpretasi data, serta menggunakan penilaian yang obyektif untuk menarik kesimpulan / *Able to design and implement laboratory experiment and / or field experiments, analyze and interpret data, and use objective assessments to draw conclusions*

CPL 6 Mampu Mampu menerapkan ilmu pengetahuan, keterampilan, dan metode terkini dalam menyelesaikan permasalahan di bidang Teknik Elektro / *Able to apply the latest knowledge, skills and methods in solving problems in the field of Electrical Engineering.*

#### **Capaian Pembelajaran Mata Kuliah / Course Learning Outcomes**

1. Mahasiswa memahami besaran fisika dan sistem satuan, serta ciri besaran skalar dan besaran vektor / *Students understand physical quantities and unit systems, as well as the characteristics of scalar quantities and vector quantities.*
2. Mahasiswa memahami definisi gerak putar dan gerak lurus secara visual dan matematis dan mampu menerapkannya kedalam penyelesaian soal / *Students understand the definition of rotary motion and straight motion visually and mathematically and are able to apply it to problem solving.*
3. Mahasiswa mampu memahami rumus gerak parabolis dua dimensi dan menerapkannya kedalam menyelesaikan soal / *Students are able to understand the formula for two-dimensional parabolic motion and apply it in solving problems.*
4. Mahasiswa memahami prinsip dasar hukum-hukum Newton dan mampu menerapkan hukum Newton, dan gaya sentripetal dalam penyelesaian soal / *Students understand the basic principles of Newton's laws and are able to apply Newton's laws, and centripetal force in solving problems.*
5. Mahasiswa memahami azas kerja dan energi mekanik, hukum kekekalan energi mekanik, dan menerapkannya kedalam soal / *Students understand the principles of work and mechanical energy, the law of conservation of mechanical energy, and apply them to problems.*
6. Mahasiswa mampu menerapkan azas impuls dan momentum, kekekalan momentum, tumbukan elastis dan tidak elastis kedalam penyelesaian soal / *Students are able to apply the principles of impulse and momentum, conservation of momentum, elastic and inelastic collisions into problem solving*
7. Memahami prinsip gerak benda tegar dan gerak menggelinding/ *Understand the principles of motion of rigid bodies and rolling motion*
8. Mampu menerapkan dalam penyelesaian soal / *Able to apply in problem solving*
9. Mahasiswa mampu memahami dan menerapkan kecepatan dan percepatan sudut, gerak rotasi, translasi, dan kesetimbangan benda tegar. / *Students are able to understand and apply angular velocity and acceleration, rotational, translational motion, and equilibrium of rigid bodies.*
10. Mahasiswa memahami getaran harmonik, hukum Hooke pada elastisitas tarik dan puntir. / *Students understand harmonic vibration, Hooke's law on tensile and torsional elasticity.*
11. Mahasiswa memahami peristiwa aliran fluida stasioner dan peranan viskositas pada aliran fluida. / *Students understand static fluid flow events and the role of viscosity in fluid flow.*
12. Mahasiswa mampu memahami skala temperatur dan jenis-jenis termometer, fenomena pemuai, konsep panas, perubahan fasa dan asas Black, kalorimeter. /

*Students are able to understand the temperature scale and types of thermometers, the phenomenon of expansion, the concept of heat, phase changes and Black's principle, calorimeters.*

13. Mahasiswa mampu memahami perpindahan panas pada zat padat, cair, dan gas (konduksi, konveksi, radiasi). / *Students are able to understand heat transfer in solids, liquids, and gases (conduction, convection, radiation).*
14. Mahasiswa mampu memahami teori kinetik gas, gas ideal, proses termodinamika dan aplikasinya, kapasitas kalor, konsep hukum termodinamika. / *Students are able to understand gas kinetic theory, ideal gas, thermodynamic processes and their applications, heat capacity, the concept of the laws of thermodynamics.*

#### **Pokok Bahasan / Contents**

1. Besaran dan Vektor: Besaran, sistem satuan, notasi vektor, komponen vektor dan vektor satuan, penjumlahan, pengurangan, dan perkalian vektor.
2. Kinematika partikel: Pergeseran posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif.
3. Dinamika partikel: Hukum Newton I, II dan III, macam-macam gaya (gaya gravitasi, gaya berat, gaya tegang tali, gaya normal, gaya gesek dan gaya pegas), kesetimbangan gaya, penerapan hukum Newton I, II dan III.
4. Kerja dan energi: Konsep kerja, energi kinetik, energi potensial (gravitasi dan pegas), teorema kerja energi, hukum kekekalan energi mekanik. Impuls dan momentum : Impuls, momentum, tumbukan (elastis dan tidak elastis), pusat massa.
5. Dinamika rotasi: Pergeseran sudut, kecepatan sudut dan percepatan sudut, momen gaya (torsi), kesetimbangan momen gaya, momen inersia, energi kinetik rotasi, gerak menggelinding, hukum kekekalan energi (translasi dan rotasi).
6. Getaran: Gerak harmonis sederhana, energi gerak harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus).
7. Mekanika fluida: Tekanan hidrostatis, prinsip Pascal, prinsip Archimedes, tegangan permukaan, persamaan kontinuitas, persamaan Bernoulli, viskositas.
8. Termometri dan kalorimetri: Skala temperatur, jenis-jenis termometer, pemuaian (panjang, luas, dan ruang), konsep kalor, perubahan fase dan asas Black, kalorimeter.
9. Perpindahan panas: Perpindahan panas pada zat padat, cair, dan gas.
10. Termodinamika: Teori kinetik gas, gas ideal, kalor dan kerja, proses termodinamika dan aplikasinya, kapasitas kalor, hukum termodinamika.

1. *Magnitude and Vectors: Magnitude, unit system, vector notation, vector components and unit vectors, addition, subtraction and multiplication of vectors.*
2. *Particle Kinematics: Position shift, velocity, acceleration, straight motion, curved motion (parabolic and circular); relative motion.*
3. *Particle dynamics: Newton's laws I, II and III, various forces (gravitational force, gravity, string tension force, normal force, friction force and spring force), force equilibrium, application of Newton's laws I, II and III.*
4. *Work and energy: Concept of work, kinetic energy, potential energy (gravitational and spring), energy work theorem, law of conservation of mechanical energy. Impulse and momentum: Impulse, momentum, collision (elastic and inelastic), center of mass.*
5. *Rotational dynamics: Angular displacement, angular velocity and angular acceleration, moment of force (torque), equilibrium moment of force, moment of inertia, rotational kinetic energy, rolling motion, law of conservation of energy (translational and rotational).*
6. *Vibration: Simple harmonic motion, energy of simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum, combined harmonized vibrations (parallel and perpendicular).*
7. *Fluid mechanics: Hydrostatic pressure, Pascal's principle, Archimedes principle, surface tension, continuity equation, Bernoulli equation, viscosity.*
8. *Thermometry and calorimetry: Temperature scale, types of thermometers, expansion (length, area, and space), concept of heat, phase change and Black's principle, calorimeter.*
9. *Heat transfer: Heat transfer in solids, liquids and gases.*
10. *Thermodynamics: Kinetic theory of gases, ideal gases, heat and work, thermodynamic processes and their applications, heat capacity, laws of thermodynamics.*

#### **Prasyarat / Pre-requisite**

#### **Pustaka / Reference**

1. Halliday, Resnic, Jearl Walker, "Fundamental of Physics", John Wiley and Sons, 10th ed, New York, 2014.
2. Douglas C. Giancoli, "Physics for Scientists and Engineers", Pearson
3. Education, 4th ed, London, 2014.
4. Tim Dosen, "Diktat Fisika I", Fisika FMIPA-ITS.
5. Tim Dosen, "Soal-soal Fisika I", Fisika FMIPA-ITS.
6. 5. -, "Petunjuk Praktikum Fisika Dasar", Fisika FMIPA-ITS.