



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 2/ *Physics 2*
/ Course Name

2 Kode Mata Kuliah : SF234201
/ Course Code

3 Kredit / *Credits* : 5 SKS

4 Semester / : 2
Semester

Deskripsi Mata Kuliah / *Course Description*

Pada mata kuliah ini mahasiswa akan belajar memahami hukum-hukum dasar fisika, Medan Listrik; Potensial Listrik; Arus Listrik ; Medan magnet; Gaya Gerak Listrik (EMF) Induksi dan Arus Bolak Balik, Optika dan Fisika Modern melalui uraian matematika sederhana serta memperkenalkan contoh pemakaian konsep. / *In this course, students will learn to understand the basic laws of physics, Electric Field; Electric Potential; Electric Current; Magnetic Field; Electric Motion Force (EMF) Induction and Alternating Current, Optics and Modern Physics through simple mathematical descriptions and introduce examples of concept usage.*

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 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 butir-butir penyusun materi serta sifat kelistrikannya, hakekat konduktor dan dielektrik.
2. Mahasiswa Memahami kuat medan listrik berdasarkan gaya coulomb dan hukum gauss
3. Mahasiswa mampu memahami berbagai bentuk potensial listrik pada konduktor bermuatan
4. Mahasiswa Memahami azas kapasitansi berbagai bentuk kapasitor pada rangkaian kapasitor, seri, paralel dan campuran
5. Mampu menggunakan rumus gaya medan magnit terhadap arus listrik dan muatan bergerak
6. Mampu menyebutkan peranan magnetisasi dalam material magnetik dan hystensis loop
7. Memahami prinsip timbulnya gaya gerak listrik, dan arus dalam resistor, kapasitor dan induktor
8. Mampu menentukan besar impedansi, besar arus listrik, dan sudut fasa pada rangkaian seri, paralel R-L, R-C, R-L- C
9. Mampu memahami konsep optika dan fenomena pemantulan serta pembiasan
10. Mampu memahami konsep fisika modern

1. *Students understand the constituent grains of matter and their electrical properties, the nature of conductors and dielectrics.*
2. *Students understand electric field strength based on coulomb force and gauss law.*
3. *Students are able to understand various forms of electric potential in charged conductors.*
4. *Students understand the principle of capacitance of various forms of capacitors in capacitor circuits, series, parallel and mixed.*
5. *Able to use the magnetic field force formula for electric current and moving charges.*
6. *Able to mention the role of magnetization in magnetic materials and hystensis loops.*
7. *Understand the principle of the generation of electromotive force, and current in resistors, capacitors and inductors.*
8. *Able to determine the amount of impedance, the amount of electric current, and the phase angle in series, parallel R-L, R-C, R-L- C circuits.*
9. *Able to understand the concept of optics and the phenomenon of reflection and refraction.*

10. Able to understand the concept of modern physics.

Pokok Bahasan / Contents

Muatan listrik, Hukum Coulomb;

1. Medan listrik: kuat medan listrik, garis gaya, perhitungan kuat medan listrik untuk muatan titik, muatan garis, cincin, piringan, silinder;
2. Hukum Gauss: fluks, garis gaya, Hukum Gauss dan aplikasinya untuk muatan silinder dan bola;
3. Potensial listrik: energi potensial, beda potensial listrik, hubungan potensial listrik dan medan listrik, perhitungan potensial listrik untuk muatan titik, muatan garis, cincin, piringan, silinder dan bola;
4. Kapasitor: Kapasitansi, perhitungan kapasitansi untuk kapasitor keping sejajar, kapasitor silinder dan kapasitor bola, rangkaian kapasitor seri dan paralel, bahan dielektrik, energi kapasitor;
5. Arus listrik: arus dan gerak muatan, hukum Ohm, resistivitas, resistansi, daya listrik; Rangkaian arus searah: rangkaian resistor seri dan paralel, hukum Kirchoff;
6. Medan magnet: fluks dan induksi magnet, gaya Lorentz, hukum Biot Savard-Ampere, perhitungan medan magnet untuk kawat lurus berarus, cincin, solenoida dan toroida;
7. GGL Induksi : Hukum Faraday, Hukum Lenz, GGL induksi, Induktansi diri dan induktansi gandeng; energi pada induktor;
8. Gejala Transien: perhitungan perubahan arus terhadap waktu untuk rangkaian RC dan CL seri
9. Arus bolak balik: arus bolak-balik dalam resistor, induktor, kapasitor, Impedansi, rangkaian R-L dan R-C untuk seri dan paralel, R-L-C seri, Daya, Resonansi.
10. Optika: Prinsip Huygens, dalil Malus, pemantulan dan pembiasan gelombang bidang, pemantulan dan pembiasan pada permukaan bola, pemantulan dan pembiasan pada permukaan datar, lensa, prisma, dispersi, alat optik, interferensi cahaya, difraksi cahaya.
11. Fisika Modern: Pengantar relativitas, gelombang materi, spektrum atom, teori atom, spektrum sinar-X, radioaktif, inti atom.

Electric charge, Coulomb's Law;

1. *Electric field: electric field strength, lines of force, calculation of electric field strength for point charge, line charge, ring, disk, cylinder;*
2. *Gauss' Law: flux, lines of force, Gauss' Law and its application to cylindrical and spherical charges;*
3. *Electric potential: potential energy, electric potential difference, relationship between electric potential and electric field, calculation of electric potential for point charge, line charge, ring, disk, cylinder and sphere;*
4. *Capacitors: Capacitance, capacitance calculation for parallel chip capacitors, cylindrical capacitors and spherical capacitors, series and parallel capacitor circuits, dielectric materials, capacitor energy;*
5. *Electric current: current and charge motion, Ohm's law, resistivity, resistance, electric power; Direct current circuits: series and parallel resistor circuits, Kirchoff's law;*
6. *Magnetic fields: magnetic flux and induction, Lorentz force, Biot Savard-Ampere law, magnetic field calculations for straight current wire, rings, solenoids and toroids;*
7. *Induced EMF: Faraday's law, Lenz's law, induced electromagnetic field, self-*

inductance and coupled inductance; energy in inductors;

8. *Transient phenomena: calculation of current change over time for RC and CL series circuits*
9. *Alternating current: alternating current in resistors, inductors, capacitors, Impedance, R-L and R-C circuits for series and parallel, R-L-C series, Power, Resonance.*
10. *Optics: Huygens principle, Malus postulate, plane wave reflection and refraction, reflection and refraction on spherical surfaces, reflection and refraction on flat surfaces, lenses, prisms, dispersion, optical devices, light interference, light diffraction.*
11. *Modern Physics: Introduction to relativity, matter waves, atomic spectrum, atomic theory, X-ray spectrum, radioactivity, atomic nucleus.*

Prasyarat / Pre-requisite

Pustaka / Reference

1. Halliday & Resnic; 'Fundamental of Physics'. John Wiley and Sons, New York, 1987
2. Tim Dosen, "Diktat Fisika II", "Soal-soal Fisika II", Fisika FMIPA-ITS
3. Giancoli, DC., (terj, Yuhilza H), 'Fisika, jilid 2', Ertangga, Jakarta, 2001