UNIVERSITY OF PANNONIA

SUBJECT DATASHEET

Semester:	2009/10/2
Subject:	Physics
Code:	VEMLFIB114A
Responsible department:	Institute of Physics and Mechatronics
Responsible department code:	MKFI
Responsible lecturer:	dr. Csaba Németh

Educational objectives:

The main objectives of this introductory physics course are: to provide a clear and logical presentation of the basic concepts and principles of physics.

Detailed content of the subject:

1. The objective and methods of the physics. The four fundamental interactions. Observation, experiment, hypothesis, theory. 2. Kinematics. Coordinate systems, position vector, path, displacement, velocity, acceleration, projectile motion, circular motion, simple harmonic motion. 3. Newton's Laws. Mass, linear momentum, force. 4. Constrained motion, incline, friction. Motion in accelerated frames. 5. Gravitation. Motion of planets. Kepler's laws, the law of universal gravitation, the gravitational field. 6. Work, energy, power. Work and kinetic energy, conservative forces, potential energy, gravitation potential and field. Conservation of mechanical energy. 7. Oscillatory motion I. Dynamics of harmonic oscillation, the simple pendulum, superposition of oscillations, Fourier's theorem. 8. Oscillatory motion II. Dumped oscillations, forced oscillations. 9. Mechanics of particle system I. Center of mass, conservation of momentum, collisions, angular momentum. 10. Mechanics of particle system II. Mechanics of rigid body. Moment of inertia, torque, angular acceleration. Precessional motion of top. 11. Mechanics of continuum I. Equation of continuity, elastic bodies, extension, shear, torsion, compression. 12. Mechanics of continuum II. Fluid mechanics. Hydrostatics. Boundary phenomenon. Hydrodynamics. Mechanic's of gas. 13. Mechanical waves. The linear wave equation, the velocity of waves, energy of waves, interference, standing waves, sound waves. 14. The theory of special relativity. I. Ether theorem, the Michelson-Morley experiment, Lorentz transformation. 15. The theory of special relativity. II. Simultaneity, time dilatation, length contraction, velocity transformation, relativistic dynamics. 16. Electric Field I. Discrete charge distributions, Coulomb's law, Charge conservation and quantization, Millikan experiment. 17. Electric Field II. Continuous charge distributions, electric flux, Gauss's law, Calculations of electric field for different systems: point charge, charged surfaces etc… 18. Electric Field III. Dipole moment, torque of a dipole, potential energy, potential, potential difference (voltage), relation between potential and electric field strength, some applications (charged sphere, point charge, etc..). 19. Electric Field IV. The Van de Graaff Generator, capacitance, capacitors, parallel plate capacitors, potential energy of a capacitor. Gauss's law in dielectrics. 20. Electric currant. Motion in electric field, Resistance, Kirchhoff's laws, DC circuit, Measuring resistance. 21. Magnetic field I. Interaction between magnets, definition of the magnetic field, magnetic moment, torque, DC motor, Measuring the currant with Deprez instrument. 22. Magnetic field II. Interaction between magnets, Biot-Savart law, Ampere's law, Applications for straight wire, solenoid, Magnetic force between parallel wires. Dia-, para- and ferromagnetism. 23. Magnetic induction. Magnetic flux, Lenz's law, Faraday's law, self- and mutual inductance, RL circuit,

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Detailed content of the subject:

Applications: metal detectors. 24. Alternating-currant circuits. AC generator, LC, RLC circuits, Resonance, phasors, transformer. 25. Mawwell's equations. Integrated and differential Maxwell's equations of the electromagnetic field, Electromagnetic waves, electric dipole radiation, Wave equation, Light 26. Properties of Light. Reflecton and Refraction, polarization, spectrum of light, speed of light. Interference and Diffraction. 27. Semiconductors. Properties of semiconductors, Devices: diodes, transistors. 28. Application of semiconductors. Led diodes, circuits and amplifiers.

Requirements:

exam

Required and suggested references:

Vonderviszt-Németh-Szalai: Fizika I. Veszprémi Egyetemi Kiadó 2003. Budó Ágoston: Kísérleti fizika I-II-III. Tankönyvkiadó Budapest Feynman: Mai fizika, Műszaki Könyvkiadó, Budapest Dede Miklós: Kísérleti Fizika I., II., Tankönyvkiadó, Budapest Baranyi Károly: A fizikai gondolkodás iskolája 1., 2., 3., Akadémiai Kiadó, Budapest Serway, R. A.: Physics for Scientists & Engineers, Saunders College Publishing