PURBANCHAL UNIVERSITY

Faculty of Engineering

Micro Syllabus (New Course)

BE Second Semester

Subject: Physics **Program: Civil/Geomatic**

Teaching Schedule Hours/Week				Examination Scheme				
Cr.	Theory	Tutorial	Practical	Internal Assessment		Final		Total Marks
				Theory	Practical	Theory	Practical	
4	4	2	2	40	10	60	15	125

S. N.	Topics	Lecture hours	Sub topics	Depth
1	Mechanical oscillation	5 hrs	1.1 Physical Pendulum: Interchangeability of point of suspension and oscillation, minimum and maximum time period, Torsion pendulum	Definition, derivation, Proof, explanation, example,
			1.2 Free oscillation	Definition, explanation, example
			1.3 Damped oscillations: angular frequency, critical damping, overdamping, and under damping	Definition, explanation, example
			1.4 Forced oscillation: Damped oscillation with a periodic driving force, Resonance, and its consequences	Definition, explanation, example
2	Ultrasonics	3 hrs	2.1 Introduction; Production of ultrasonics: Mechanical method (Introduction only); Piezoelectric generator; Magnetostriction oscillator	Definition, explanation, example
			2.2 Detection of ultrasonic; Applications of ultrasonics	explanation, example
			2.3 Acoustic grating: Determination of velocity of sound in a liquid	Definition, explanation, example
3	Relativity	5 hrs	3.1 Frame of reference; Inertial and non-Inertial frames of references	Definition, explanation, example
			3.2 Postulates of the special theory of	explanation

			relativity	
			3.3 Lorentz transformation equations; Length contraction; Time dilation. Twin paradox	Definition, derivation, Proof, explanation, example,
			3.4 Simultaneity; Relativistic mass; Mass and energy	Definition, derivation, Proof, explanation, example,
			3.5 Space-time diagram.	explanation
4	Optics	Geometrical optics 3 hrs	4.1.1 Sign Convention (Cartesian coordinate system), Equivalent focal length of two thin lenses separated by a finite distance; Cardinal points of an optical system.	Definition, derivation, Proof, explanation, example,
			4.1.2 Chromatic aberration in a lens (longitudinal chromatic aberration), Condition for achromatism of two thin lenses in contact and separated by a finite distance	Definition, derivation, Proof, explanation, example,
		Fiber optics 3 hrs	4.2.1 Introduction; Step index optical fiber, Graded index optical fiber.	Definition, explanation, example,
			4.2.2 Self-focusing; Acceptance angle; Numerical aperture.	derivation, explanation, example,
			4.2.3 Application of optical fiber.	explanation, example,
	10 hrs	Interference	Interference: Young's double-slit experiment; Analytical treatment of interference; Fresnel's Biprism; Interference in thin-film: reflected and transmitted light; Wedge shape thin film: determination of fringe width; Newton's rings: reflected and transmitted light; determination of the wavelength of light and refractive index of the liquid.	Definition, derivation, Proof, explanation, example,
		Diffraction	Introduction: Fresnel and Fraunhofer diffraction; Faunhofer's diffraction at a single slit; Intensity in single diffraction pattern (qualitative); Fraunhofer diffraction at double slit; Diffraction grating; Holography and Interference pattern	Definition, explanation, example
		Polarization	Malus Law, Double refraction; Nicol	Definition,

			prism Quarter wave plate; Half-wave plate; Optical activity; Specific rotation	explanation, example
5	Electrostatics	7 hrs	5.1 Electric field intensity, Electric dipole and dipole moment, Electric field intensity due to a dipole (at an axial and equatorial line), Electric quadrupole and quadrupole moment, Electric field intensity due to quadrupole (at an axial line)	Definition, derivation, Proof, explanation, example,
			5.2 Electric potential, Electric potential due to a dipole, Electric potential due to quadrupole (at an axial line)	Definition, derivation, Proof, explanation, example,
			5.3 Electric flux, Gauss's law (statement only), Application of Gauss's law: Spherical charge distribution (non-conducting and conducting)	Definition, Derivation explanation, example,
			5.4 Ink-jet printing; Volcanic lightning	Definition, explanation,
			5.5 Capacitor and capacitance, Parallel plate capacitor and Cylindrical capacitor, Supercapacitor (introduction only), Energy stored in electric field and energy density	Definition, explanation, example,
			5.6 Polar and non-polar dielectrics, Polarization, Gauss's law, and dielectrics (Relation between **E**, **D**, and **P**)	Definition, explanation, example,
6	Direct current	3 hrs	6.1 Electric Current; Current Density, Drift Speed	Definition, explanation, example,
			6.2 Effect of Temperature on Resistance and Resistivity; Microscopic view of Ohm's Law.	Definition, explanation, example,
			6.3 Superconductivity, Critical Magnetic field, ,The Meissner Effect, Types of Super conductors	Definition, explanation, example,
7.	Magnetism and Magnetic field	8 hrs	7.1 Magnetic properties of matter; Domain theory; Ferromagnetism; Saturation and hysteresis	Definition, explanation, example,
			7.2 Lorentz force; Cyclotron; Cyclotron frequency; Synchrotron; Hall effect	Definition, derivation, Proof, explanation, example,
			7.3 Current carrying coil as a magnetic	Definition,

			dipole; Magnetic field produced by a magnetic dipole	derivation, Proof, explanation, example,
			7.4 Faraday's law of electromagnetic induction; Lenz's law; Electric guitars	Definition, explanation, example,
			7.5 Self-induction; Inductance of a Solenoid; Metal detector	Definition, explanation, example,
			7.6 Eddy currents; Induction stoves	Definition, explanation, example,
			7.7 LR circuit, Energy stored in magnetic field; Energy density of magnetic field.	Definition, derivation, Proof, explanation, example,
			7.8 Induced Magnetic Field; Displacement Current	Definition, explanation, example,
8	Electromagnetic waves	5 hrs	8.1 Gauss divergence theorem and Stoke's theorem (statement only).	Definition, explanation, example,
			8.2 Maxwell's equation (integral to differential form); Equation of continuity.	Definition, derivation, explanation, example,
			8.3 Wave equation in free space and medium.	Definition, derivation, explanation, example,
			8.4 Speed of electromagnetic wave; Ratio of electric field and magnetic field.	Definition, explanation, example,
			8.5 Poynting vector	Definition, explanation, example,
9	Quantum Mechanics	5 hrs	9.1 Newtonian mechanics and Quantum mechanics	explanation, example,
			9.2 Matter wave: de-Broglie wave equation; Uncertainty Principle (qualitative); Phase velocity and group velocity: relation between phase velocity and group velocity	Definition, explanation, example,
			9.3 Wave function; Physical	Definition,

				interpretation of the wave function	explanation, example,
			9.4	Schrodinger wave equation (time-independent and time-dependent)	Definition, derivation, explanation, example,
			9.5	Applications of Schrodinger wave equation: Particle in one dimensional Infinite potential well; Normalization and probability density; Potential barriers and Tunneling effect (transmission coefficient qualitative); Application of Tunneling	Definition, derivation, explanation, example,
10	Non-Destructive Testing	3 hrs	10.1	Introduction; Methods of non-destructive testing: Magnetic method; Electrical method; Radiographic method; Ultrasonic method; Thermal method	Definition, explanation, example,
			10.2	Comparisons of γ-ray radiography and X-ray radiography; Thermography	Definition, explanation, example,

Reference Books:

1. Halliday, Resnick, and Walker-Fundamentals of Physics, 6th Edition, John Wiley & Sons
2. Vasudeva A.S.-Modern Engineering Physics, S. Chand & Company Ltd, New Delhi
3. Subrahmanyam and Brij Lal-A Text Book of Optics, S. Chand & Company Ltd, New Delhi
4. B.K. Sapkota, B. Pokharel and B. K. Bhattarai, Fundamentals of Engineering Physics, Benchmark Publication, Kathmandu.
5. Sears and Zemansky's-University Physics with Modern Physics, 12th Edition, Pearson Education.
6. C. L. Arora-BSc Practical Physics, S. Chand & Company Ltd.
7. B. K. Sapkota and B. Pokharel, Engineering Practical Physics, Benchmark Publication, Kathmandu.

S. N.	Topics	Time allocation	Marks	Types of questions		
				Very short	Short	Long
1	Mechanical oscillation/relativity	10 hrs	14	1	1	1
2	Ultrasonics	3 hrs	4		1	
3	Geometrical Optics/Physical Optics	13 hrs	18	1	1 or 1	1
4	Fiber optics	3 hrs	4		1	
5	Electrostatics/ Direct current	10 hrs	14	1	1	1
6	Magnetism and Magnetic field/	13 hrs	14	1	1	1