KINGDOM OF SAUDI ARABIA

Technical and Vocational Training Corporation

General Directorate of Curricula

المؤسسة العامة للتدريب التقني والمهني
Technical and Vocational Training Corporation

General Studies Department

General Courses

Department	General Studies	Major	Engineers and Scientists			
Course Name	Physics I	**Course Code**	PHYS 361			
Prerequisites	PHYS 301	**Credit Hours**	4		CTH	6
		CRH	L 3	P 2	T 1	

Course Description :

An engineer might design the product itself, or just figure out a way to build it. But either way, success is impossible without an understanding of the physics behind each of them. This course enables students to gain theoretical and practical background in physics. This course contains two parts:

Part 1: **Mechanic**: Introduction (Vectors ,system coordinates, kinematic quantities), Motion in two and three Dimensions with Applications to Projectile motion, Circular and Helical motions, Newton's Laws of Motion and Applications, Work and Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Moment of force, Torque, Moment of inertia, Angular acceleration, Rotation of rigid object about a fix axis.

Part 2: **Electricity and Magnetism**: Coulomb's law, Electric fields, Gauss' Law, Electric potential, Potential energy, Capacitance and Dielectric, Currents and Resistance, Electrical Energy and Power, Direct current circuits, Kirchhoff's rules, Magnetic fields, Motion of charged particle in a magnetic field, Sources of the magnetic field, Ampere's law, Faraday's law of induction, Self-inductance, energy in a magnetic field, Mutual inductance, Alternating current circuits, the RLC series circuit, power in an A.C. circuit, resonance in RLC circuit.

A series of experiments is designed to give the student an expertise in measurements and interpretation of physical phenomenon.

General Objective:

This course aims at teaching the future engineer the principle skills on various areas of physics. Students should become proficient in the topics of mechanic, electricity and magnetism. Students should be able to connect the concepts presented to the uses in engineering applications.

Detailed Objectives:
   Trainee will be able to:

1-	Understand the basic notions and principles of the applied physics
2-	Analyze physical systems
3-	Formulate approach for solving physics problems (Mechanical and Electromagnetic)
4-	Establish competence in complex problem solving
5-	To make the connection between the technical problem and the adequate physical principle

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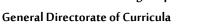**Technical and Vocational Training Corporation**

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	Detailed of Theoretical Contents	
Hours	**Contents**	**Assessment Tools**
4	**1. Coordinate Systems and Vectors** • Cartesian Coordinates • Cylindrical Coordinates • Spherical Coordinates • displacement, surface and volume elements • dot and cross product of vectors	Oral, Quizzes,
	Textbook 1 Fundamentals of physics, David Halliday, Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition 2 Physics for Scientists and Engineers (6th edition)- R. A. Serway& Jewett	
4	**2. Kinematics of Material Point for Rotational Motion** • **S**pace and Time referential. • Definitions: Position, Velocity, Acceleration and trajectory of a particle. • Curvature radius • The Rotational Variables (angular position, angular displacement, angular velocity, angular acceleration). • Rotation with Constant Angular Acceleration • Kinematic Equations for Constant Angular Acceleration • Relation between the Linear and Angular Variables for constant acceleration motion. • Applications for Curvilinear Motion: Circular, Helical. • Kinetic Energy of Rotation • **Examples and Problems**	Oral, Quizzes, Homework 1
	Textbook 1 Fundamentals of physics, David Halliday, Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition 2 Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
4	**3. Center of Mass and Linear Momentum** • The center of mass • Newton's Second Law for a System of Particles • Linear Momentum • The Linear Momentum of a System of particles • Collision and Impulse • Conservation of Linear Momentum • Momentum and Kinetic Energy in Collisions • Inelastic Collisions in One Dimension	Oral, Quizzes, Homework 2 First Exam (Units: 1,2,3)

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Detailed of Theoretical Contents			
Hours	**Contents**		**Assessment Tools**
	• Elastic Collisions in One Dimension • Collisions in Two Dimensions • **Examples and Problems**		
	Textbook	1	Fundamentals of physics, David Halliday, Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition	
		2	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
7	**4. Rotational Motion of a Rigid Body** • **Inertia** • Example of Calculating the Rotational Inertia for rigid body • Parallel-Axis Theorem • **Torque: $\tau = r \cdot F . \sin \theta$** • Newton's Second Law for Rotation • Work and Rotational Kinetic Energy • **Rolling, Torque, and Angular Momentum** • Rolling as Translation and Rotation Combined • The Kinetic Energy of Rolling • The Forces of Rolling • Torque in the cross product form : $\tau = r \times F$ • Angular Momentum • Newton's Second Law in Angular Form • The Angular Momentum of a System of Particles • The Angular Momentum of a Rigid Body Rotating About a fixed axis • Conservation of Angular Momentum • **Examples and Problems**		Oral, Quizzes, Homework 3
	Textbook	1	Fundamentals of physics, David Halliday, Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition	
		2	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
6	**5. Circuit in Permanent, Transient and Sinusoidal Forced Regimes:** Pre-requisites: • DC source • Current divider • Voltage divider • Kirchhoff's laws.		

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Hours	Contents	Assessment Tools
	Here we begin a discussion of time-varying currents. • **Transient regime:** • RC charging and discharging of a capacitor, the time response $\tau_c = RC$. • RL Circuit response of external excitation, the time response $\tau_L = L/R$. • Transient regime (RLC circuit) • Differential equation in current or voltage and solution(harmonic and damped oscillations) • **Alternating Circuit Current:** • Storage and damping of electric energy • Sinusoidal AC source • Resistors in an AC circuit • rms current and rms voltage • Capacitors in an AC circuit • The capacitive reactance X_C. • Inductors in an AC circuit. • The inductive reactance X_L. • Oscillations in an RLC series circuit (Differential equation and solution). • The impedance Z. • The voltage amplitudes across the RLC elements. • Power in an AC circuit. • Resonance in a series RLC circuit. • The resonance frequency. • The transformer. • Analogy between Mechanical and Electrical Oscillators • **Examples and Problems**	Oral, Quizzes, Homework 4 Second Exam (units: 4, 5)

	Textbook	1	Fundamentals of physics, David Halliday, Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition	
		2	Physics for Scientists and Engineers (6th edition)- R. A. Serway& Jewett	

Hours	Contents	Assessment Tools
5	**6. Electric fields and electric potential** • Coulomb's law. • The electric fields. • Electric field line. • Electric field due to a point charge • Symmetry elements of a distribution of charge • Superposition principle • Electric field due to an electric dipole • Electric field due to a line of charge	Oral, Quizzes, Homework 5

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Detailed of Theoretical Contents			
Hours	**Contents**		**Assessment Tools**
	• Electric field due to charge disk • Flux of an electric field. • Gauss's theorem • Electric potential. • Calculating the potential from the electric field. • Potential due to a point charge and electrical dipole. • Calculating the field from the potential. **Examples and Problems**		
	Textbook	1	Fundamentals of physics, David Halliday, Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition	
		2	Physics for Scientists and Engineers (6th edition)- R. A. Serway& Jewett	
4	**7. The magnetic field** • Magnetic field and magnetic field lines. • Biot-Savart law • Symmetry elements of a distribution of current. • Ampere's theorem: magnetic field due to a long straight wire, a circular conductor, a solenoid, • Hall Effect. • Discovering of the electron and measuring e/m • The magnetic force. • Magnetic fluxacross a circular turn. • Electromagnetic induction and Faraday's law. • Electromotive force. • **Examples and Problems**		Oral, Quizzes, Homework 6 Final Exam (All units)
	Textbook	1	Fundamentals of Physics, David Halliday,Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition	
		2	Physics for Scientists and Engineers (6th edition)- R. A. Serway& Jewett	

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Hours	Contents			Assessment Tools
	Detailed of Practical Contents			
4	**1. Equilibrium condition of a rigid body subjected to a set of forces**			Lab Exp. Report
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway& Jewett	
		2	Booklet of practical works realized in the department	
4	**2. Equilibrium condition of arigid body able to rotate around a fixed axis**			Lab Exp. Report
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
		2	Booklet of practical works realized in the department	
6	**3. Measurement of acceleration due to gravity (g) by a compound pendulum**			Lab Exp. Report
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
		2	Booklet of practical works realized in the department	
6	**4. Transient regimes: RC circuits.**			Lab Exp. Report
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
		2	Booklet of practical works realized in the department	
6	**5. Transient regimes: RL circuits.**			Lab Exp. Report
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
		2	Booklet of practical works realized in the department	
6	**6. Transient regimes: RLC circuits.**			Lab Exp. Report
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
		2	Booklet of practical works realized in the department	
6	**7. Sinusoidal driven oscillator and resonance intensity and frequency: RLC circuit**			Lab Exp. Report
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
		2	Booklet of practical works realized in the department	
6	**8. Study of the deflection of electron in a magnetic field into a circular orbit**			Lab Exp. Report + Final Practical Exam
	Textbook	1	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett	
		2	Booklet of practical works realized in the department	

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Textbooks	●	Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker. John Wiley and Son, INC,ISBN 978-0-470-46908-8. Ninth edition
	●	Physics for Scientists and Engineers (6th edition)- R. A. Serway & Jewett
	●	Foundations of Physics for Technology Colleges and Universities Freshmen, Dr. Marwan Al Fahhad, Third edition2012

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List of Detailed Equipment for Laboratory, Workshop or Lab

No.	Laboratory name / workshop	Capacity of training	Human Resources with Certificate
1-	Physics Lab	20 Students	1 Laboratory technician

Workshop / Lab of Physics		
No.	**Product's Name**	**Quantity**
1-	Force table	10
2-	Two arm, straight lever, angular lever, single arm lever	10
3-	Retort stand, pendulum bob, thread, meter rule, stop watch	10
4-	Variable resistor + Standard resistor values, variable inductance, variable capacitor + Standard capacitor values	10
5-	Digital oscilloscope	10
6-	Function generator	10
7-	Bar and Horseshoe magnet, Flat coil, solenoid, Transformer	10