

Physics Unit 2 Program

Text Books:

- APFY: Advanced Physics for You,
- STAWA: Exploring Physics Year 11.

Term One

Week	Classification	Content	Textbook Reading	Problem Sets	Practicals	Assessments
Term 1 Wk 1	<u>Mathematical Concepts</u>	<ul style="list-style-type: none"> • Introduction to program <ul style="list-style-type: none"> ○ Understand the SI system of quantities for units. ○ Use correct units, symbols and notation. ○ Differentiate between accuracy and precision of data. ○ Calculate uncertainty in experimental results. ○ Carry out graphical analysis of data. ○ Mathematical Concepts ○ Significant Figures ○ Scientific Notation ○ Standard International ○ Formula Booklet (name the variables and their units) ○ Rearranging Equations 	STAWA page 9 APFY Pages 6-9		Experiment “Slide Measurement” Video “Measurement & Uncertainty”	

Week	Classification	Content	Textbook Reference	Problem Sets	Practicals	Assessments
Term1 Wk 1 - 2	<u>Vectors & Uniform Motion</u>	<ul style="list-style-type: none"> Distinguish between vector and scalar quantities, and add and subtract vectors in two dimensions. Distinguish between scalar and vector quantities. Define 'displacement' and state its SI unit. Distinguish between distance and displacement. Define 'speed' and 'velocity' and state their SI unit. Distinguish between speed and velocity Calculate constant, instantaneous and average speed and velocity from tabulated and graphical data. Define 'acceleration' and state its SI unit. uniformly accelerated motion is described in terms of relationships between measurable scalar and vector quantities, including displacement, speed, velocity and acceleration. <p><i>This includes applying the relationships</i></p> $v_{av} = \frac{s}{t}, \quad a = \frac{v-u}{t},$ $v = u + at, \quad s = ut + \frac{1}{2}at^2, \quad v^2 = u^2 + 2as$	<p>STAWA page 136 page 141</p> <p>APFY Pages 10-16</p> <p>APFY Pages 38-46</p>	<p>Set 14 page 139 – 140</p> <p>Set 15 page 145-147</p>	<p>Experiment 14.1 Navigating Vectors</p> <p>Experiment 14.2 Rolling Along</p> <p>Experiment 15.1 Going Faster</p> <p>Experiment 15.2 Reaction Times</p>	
Term 1 Wk 3 - 4	<u>Graphs & Equations</u>	<ul style="list-style-type: none"> Draw and interpret graphs of objects moving including the interpretation of slope and area. Understand representations, including graphs, vectors, and equations of motion, can be used qualitatively and quantitatively to describe and predict linear motion Analyse vertical motion by assuming the acceleration due to gravity is constant near Earth's surface. 	APFY Pages 40-41			

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Term 1 Wk 4 - 5	<u>Newton's Laws</u>	<ul style="list-style-type: none"> Define 'inertia'. Define 'mass' and state its SI unit. Describe the effects produced by forces. Application and understanding of Newton's three Laws of Motion - the relationship between the force or forces acting on an object, modelled as a point mass, - the motion of the object due to the application of the force or forces. 	STAW page 149-150 APFY Pages 52-59	Set 16 page 154-156	Experiment 16.1 Newtons Second Law Experiment 16.2 Friction	
Term 1 Wk 5		<ul style="list-style-type: none"> Draw free body diagrams showing the forces and net force acting on objects from descriptions of real life situations (in one or two dimensions) <p><i>This includes applying the relationships resultant $F = ma$, $F_{weight} = mg$</i></p>				

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Term 1 Wk 6-7	<u>Momentum & Conservation of Energy</u>	<ul style="list-style-type: none"> Define 'momentum' and state its SI unit. State and explain the law of conservation of momentum. Understand that momentum is a property of moving objects; it is conserved in a closed system and may be transferred from one object to another when a force acts over a time interval A change in momentum -impulse <i>This includes applying the relationships</i> $p = m v, \quad \sum m v_{before} = \sum m v_{after}$$m v - m u = \Delta p = F \Delta t$ Collisions may be elastic and inelastic; kinetic energy is conserved in elastic collisions <i>This includes applying the relationship</i> $\sum \frac{1}{2} m v^2_{before} = \sum \frac{1}{2} m v^2_{after}$ 	STAWA page 160-161 APFY Pages 62-65	Set 17 page 164-166	Experiment 17.1 Conservation of Momentum in an Explosion Experiment 17.2 Conservation of Momentum in a Collision	
Term 1 Wk 8	<u>Energy</u>	<ul style="list-style-type: none"> energy is conserved in isolated systems and is transferred from one object to another when a force is applied over a distance; this causes work to be done and changes the kinetic (E_k) and/or potential (E_p) energy of objects <i>This includes applying the relationships</i> $E_k = \frac{1}{2} m v^2, \quad E_p = m g \Delta h,$ $W = F s, \quad W = \Delta E$ 	STAWA page 168 APFY Pages 68-75	Set 18 Pages 172-174	Experiment 18.1 Roller Coaster	
Term 1 Wk 9-10	<u>Power</u>	<ul style="list-style-type: none"> power is the rate of doing work or transferring energy <i>This includes applying the relationship</i> $P = \frac{W}{t} = \frac{\Delta E}{t} = F v_{av}$ 	APFY Pages 68-75		Experiment 18.1 Vehicle Power	Task 2 Motion Research Assignment Due
Term 1 Wk 10	<u>Application</u>	<ul style="list-style-type: none"> safety for road users has been increased through development and use of devices, including: <ul style="list-style-type: none"> helmets & safety barriers seatbelts & airbags crumple zones 	APFY Pages 65			Task 11 Motion Test Task 2 Motion Research Assignment Due

Term Two

Week	Classification	Content	Textbook Reference	Problem Sets	Practicals	Assessments
Term 2 Wk 1	<u>Introduction to Waves</u>	<ul style="list-style-type: none"> waves are periodic oscillations that transfer energy from one point to another. mechanical waves transfer energy through a medium; longitudinal and transverse waves are distinguished by the relationship between the directions of oscillation of particles relative to the direction of the wave velocity. waves may be represented by displacement/time and displacement/distance wave diagrams and described in terms of relationships between measurable quantities, including period, amplitude, wavelength, frequency and velocity. <p><i>This includes applying the relationships</i></p> $v = f \lambda, \quad T = \frac{1}{f}$	STAWA page 180 APFY Pages 122-129	Set 19 pages 185-188	Experiment 19.1 Making Waves	
Term 2 Wk 2	<u>Wave Behaviours</u>	<ul style="list-style-type: none"> the mechanical wave model can be used to explain phenomena related to reflection and refraction, including echoes and seismic phenomena. 	STAWA page 189 APFY Selected pages of chapter 11 as directed	Set 20 pages 199-204 Q1 to Q9	Experiment 20.1 Observing Wave Pulses Experiment 20.2 Diffraction and Interference	

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Term 2 Wk 3	<u>Waves & Mediums</u>	<ul style="list-style-type: none"> the superposition of waves in a medium may lead to the formation of standing waves and interference phenomena, including standing waves in pipes and on stretched strings. <p><i>This includes applying the relationships for strings attached at both ends and pipes open at both ends</i></p> $\lambda = \frac{2l}{n}$ <p>pipes closed at one end</p> $\lambda = \frac{4l}{(2n-1)}$ <ul style="list-style-type: none"> application of the wave model has enabled the visualisation of imaging techniques, for geophysical exploration, such as seismology. SHE application of the wave model has enabled the visualisation of imaging techniques for medical applications, such as ultrasound. (SHE) the intensity of a wave decreases in an inverse square relationship with distance from a point source <p><i>This includes applying the relationship</i></p> <ul style="list-style-type: none"> $I \propto \frac{1}{r^2}$ 	APFY Selected pages of chapter 12 as directed		Experiment 20.3 Resonance in Strings	

<p>Term 2 Wk 4-5</p>	<p><u>Waves</u> <u>Properties</u></p>	<ul style="list-style-type: none"> • a mechanical system resonates when it is driven at one of its natural frequencies of oscillation; energy is transferred efficiently into systems under these conditions. • noise pollution comes from a variety of sources and is often amplified by walls, buildings and other built structures. Acoustic engineering, based on an understanding of the behavior of sound waves, is used to reduce noise pollution. It focuses on absorbing sound waves or planning structures so that reflection and amplification do not occur. (SHE) 	<p>APFY Selected pages of chapter 12 as directed</p>	<p>Set 20 page 185-188 Q10 to 30</p> <p>Waves Context: Music and Communication Pages 208-209</p>	<p>Experiment 20.4 Resonance in Air Columns</p> <p>Experiment 20.5 Beat Patterns</p>	<p>Task 12 Waves Test</p>
<p>Term 2 Wk 6</p>		<ul style="list-style-type: none"> • revision and practice exams 				<p>Task 3 Evaluation and Analysis: Nuclear Medicine</p>

SEMESTER 1 EXAMINATIONS (Task 8)

Physics Unit 1 Program

Text Books:

- Advanced Physics for You,
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Term Two

Week	Classification	Content	Textbook Reference	Problem Sets	Practicals	Assessments
Term 2 Wk 8	<u>Kinetic Theory</u>	<ul style="list-style-type: none"> • the kinetic particle model describes matter as consisting of particles in constant motion, except at absolute zero. • all substances have internal energy due to the motion and separation of their particles. • temperature is a measure of the average kinetic energy of particles in a system. 	STAWA Pages 12-13 APFY Selected pages of chapter 14 as directed	Set 1 Pages 16		
Week	Classification	Content	Textbook Reference	Problem Sets	Practicals	Assessments
Term 3 Wk 1	<u>Specific & Latent Heat</u>	<ul style="list-style-type: none"> • provided a substance does not change state, its temperature change is proportional to the amount of energy added to or removed from the substance; the constant of proportionality describes the heat capacity of the substance <i>This includes applying the relationship</i> $Q = m c \Delta T$ • change of state involves separating particles which exert attractive forces on each other; latent heat is the energy required to be added to or removed from a system to change the state of the system <i>This includes applying the relationship</i> $Q = m L$ 	STAWA Page 26 APFY Selected pages of chapter 14 as directed	Set 3 Pages 30-31 Set 4 Pages 41-42	Experiment 3.1 Specific Heat of Liquid Experiment 3.2 Specific Heat of Metal Experiment 3.3 Specific Heat Capacity of a Brick Experiment 4.2 Melting Ice	

Week	Classification	Content	Textbook Reference	Problem Sets	Practicals		Assessments
		<ul style="list-style-type: none"> • 					
		<ul style="list-style-type: none"> • The development of heating technologies that use conduction, convection, radiation and latent heat have had, and continue to have, significant social, economic and environmental impacts. These technologies include: <ul style="list-style-type: none"> ○ passive solar design for heating and cooling of buildings. (SHE) • the use of the sun for heating water. (SHE) 					<p>Task 4 Investigation: Specific Heat Capacity</p>
<p>Term 3 Wk 2</p>		<ul style="list-style-type: none"> • a system with thermal energy has the capacity to do mechanical work [to apply a force over a distance]; when work is done, the internal energy of the system changes. • because energy is conserved, the change in internal energy of a system is equal to the energy added by heating, or removed by cooling, plus the work done on or by the system. 					<p>Task 8 Heat Topic Test</p>

Week	Classification	Content	Textbook Reference	Problem Sets	Practicals	Assessments
Term 3 Wk 3	<u>The Nuclear Atom & Radiation Types</u>	<ul style="list-style-type: none"> the nuclear model of the atom describes the atom as consisting of an extremely small nucleus which contains most of the atom's mass, and is made up of positively charged protons and uncharged neutrons surrounded by negatively charged electrons. alpha, beta and gamma radiation have different natures, properties and effects. some nuclides are unstable and spontaneously decay, emitting alpha, beta (+/-) and/or gamma radiation over time until they become stable nuclides. alpha and beta decay are examples of spontaneous transmutation reactions, while artificial transmutation is a managed process that changes one nuclide into another. 		Set 5 Pages 57-59	Experiment 5.2 Range of Alpha and Beta Particles in Air Experiment 5.3 Penetrating Power of Radiation	Task 5 Evaluation and Analysis: Energy Efficient Building
Term 3 Wk 4	<u>Half-life & Nuclear Medicine</u>	<ul style="list-style-type: none"> each species of radionuclide has a half-life which indicates the rate of decay. <i>This includes applying the relationship</i> $N = N_0 \left(\frac{1}{2}\right)^n$ radioisotopes are used as diagnostic tools and for tumour treatment in medicine. (SHE) the measurement of absorbed dose and dose equivalence enables the analysis of health and environmental risks <i>This includes applying the relationships</i> absorbed dose = $\frac{E}{m}$, dose equivalent = absorbed dose × quality factor 		Set 6 page 64-66 Set 7 page 73-75	Experiment 6.1 Simulated Radioactive Decay Experiment 7.1 Radiation and Distance	

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Term 3 Wk 5	<u>Nuclear Stability, Energy & Mass Difference</u> s	<ul style="list-style-type: none"> nuclear stability is the result of the strong nuclear force which operates between nucleons over a very short distance and opposes the electrostatic repulsion between protons in the nucleus. Einstein's mass/energy relationship relates the binding energy of a nucleus to its mass defect. <i>This includes applying the relationship</i> $\Delta E = \Delta m c^2$ Einstein's mass/energy relationship also applies to all energy changes and enables the energy released in nuclear reactions to be determined from the mass change in the reaction. <i>This includes applying the relationship</i> $\Delta E = \Delta m c^2$ 	STAWA page 79-80			Task 6 Evaluation and Analysis: Nuclear Medicine
Term 3 Wk 6	<u>Fission & Fusion</u>	<ul style="list-style-type: none"> neutron-induced nuclear fission is a reaction in which a heavy nuclide captures a neutron and then splits into smaller radioactive nuclides with the release of energy. a fission chain reaction is a self-sustaining process that may be controlled to produce thermal energy, or uncontrolled to release energy explosively if its critical mass is exceeded. nuclear power stations employ a variety of safety mechanisms to prevent nuclear accidents, including shielding, moderators, cooling systems and radiation monitors. (SHE) nuclear fusion is a reaction in which light nuclides combine to form a heavier nuclide, with the release of energy. more energy is released per nucleon in nuclear fusion than in nuclear fission because a greater percentage of the mass is transformed into energy. the management of nuclear waste is based on the knowledge of the behaviour of radiation. (SHE) 		Set 8 pages 83-84 Nuclear Context: Nuclear Energy Pages 86-87	Experiment 8.1 Simulated Chain Reaction	Task 9: Nuclear Test

Week	Classification	Content	Textbook Reference	Problem Sets	Practicals	Assessments
Term 3 Wk 7	<u>Charges & Current</u>	<ul style="list-style-type: none"> there are two types of charge that exert forces on each other. energy is conserved in the energy transfers and transformations that occur in an electrical circuit. energy is required to separate positive and negative charge carriers; charge separation produces an electrical potential difference that drives current in circuits. the energy available to charges moving in an electrical circuit is measured using electric potential difference, which is defined as the change in potential energy per unit charge between two defined points in the circuit. <i>This includes applying the relationship</i> $V = \frac{W}{q}$ electric current is carried by discrete charge carriers; charge is conserved at all points in an electrical circuit <i>This includes applying the relationship</i> $I = \frac{q}{t}$ 	STAWA Pages 90-91	Set 9 page 94-95 Set 11 page 109-110	Experiment 9.1 Creating and Storing Charge	

Week	Classification	Content	Textbook Reference	Problem Sets	Practicals	Assessments
Term 3 Wk 8	<u>Power & Ohmic/ Non-ohmic Resistance</u>	<ul style="list-style-type: none"> resistance depends upon the nature and dimensions of a conductor. resistance for ohmic and non-ohmic components is defined as the ratio of potential difference across the component to the current in the component <i>This includes applying the relationship</i> $R = \frac{V}{I}$ power is the rate at which energy is transformed by a circuit component; power enables quantitative analysis of energy transformations in the circuit <i>This includes applying the relationship</i> $P = \frac{W}{t} = VI$ 		Set 10 page 101-102	Experiment 10.1 Measuring Electrical Energy	
Term 3 Wk 9	<u>Parallel & Series Circuits</u>	<ul style="list-style-type: none"> circuit analysis and design involve calculation of the potential difference across the current in, and the power supplied to, components in series, parallel, and series/parallel circuits <i>This includes applying the relationships</i> Series I = constant $V_t = V_1 + V_2 + V_3 \dots$ $R_t = R_1 + R_2 + R_3 \dots$ Parallel V = constant $I_t = I_1 + I_2 + I_3 \dots$ $R_t^{-1} = R_1^{-1} + R_2^{-1} + R_3^{-1} \dots$ 		Set 12 page 120-121	Experiment 12.1 Resistors in Series Experiment 12.2 Resistors in Parallel Experiment 12.3 Sources of EMF in Series and Parallel	Task 5: Experiment Unknown Resistor

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Term 4 Wk 1-2	<u>Components & Safety</u>	<ul style="list-style-type: none"> electrical circuits enable electrical energy to be transferred and transformed into a range of other useful forms of energy, including thermal and kinetic energy, and light. design of effective safety devices for the safe operation of: <ul style="list-style-type: none"> lighting power points stoves other household electrical devices. (SHE) there is an inherent danger involved with the use of electricity that can be reduced by using various safety devices, including fuses, residual current devices (RCD), circuit breakers, earth wires and double insulation. (SHE) 		Set 13 page 129-130	Experiment 13.1 Fuses Experiment 13.2 Short Circuits	Task 10: Electricity Test
Term 4 Wk 3		<ul style="list-style-type: none"> revision and practice exams 				

SEMESTER 2 EXAMINATIONS (Task 14)