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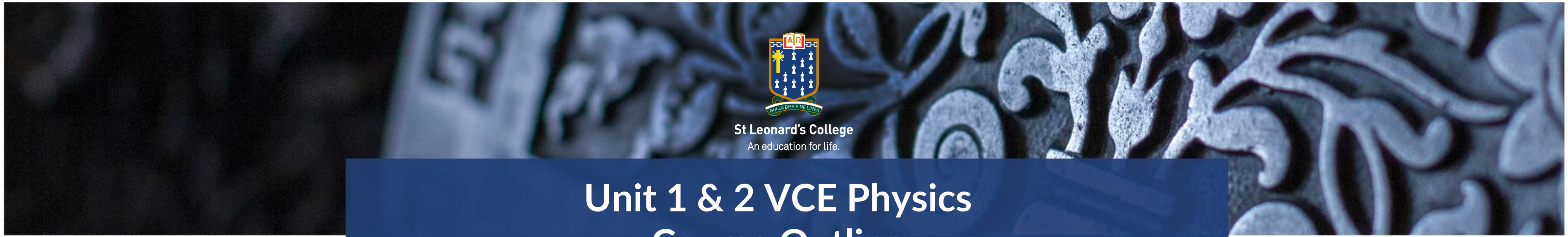
Unit 1 & 2 VCE Physics Course Outline

2023

Wk	Topics	Key knowledge	Learning activities	Assessment tasks and opportunities	Other dates
Transition 2023					
8	Concepts used to model electricity Circuit electricity Using electricity	• apply concepts of charge (Q), electric current (I), potential difference (V), energy (E) and power (P), in electric circuits • analyse and evaluate different analogies used to describe electric current and potential difference • investigate and analyse theoretically and practically electric circuits using the relationships: $I = \frac{Q}{t}, V = \frac{E}{Q}, P = \frac{E}{t} = VI$ • justify the use of selected meters (ammeter, voltmeter, multimeter) in circuits • apply the kilowatt-hour (kW h) as a unit of energy	Practical investigations using electric circuits including: • measuring current and voltage • potentiometer and voltage divider circuits Poster: Factors affecting resistance	N/A	
9		• model resistance in series and parallel circuits using: ○ current versus potential difference (I–V) graphs ○ resistance as the potential difference to current ratio, including R = constant for ohmic devices ○ equivalent resistance in arrangements in ▪ series: $R_{equivalent} = R_1 + R_2 + ... + R_n$ and ▪ parallel: $\frac{1}{R_{equivalent}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_n}$			
10		• calculate and analyse the equivalent resistance of circuits comprising parallel and series resistance • analyse circuits comprising voltage dividers • compare power transfers in series and parallel circuits • explain why circuits in homes are mostly parallel circuits			
11		• investigate and apply theoretically and practically concepts of current, resistance, potential difference (voltage drop) and power to the operation of electronic circuits comprising resistors, light bulbs, ~~diodes~~, thermistors, light dependent resistors (LDRs), ~~light-emitting diodes (LEDs) and~~ potentiometers (quantitative analysis restricted to use of I=V/R and P = VI) • investigate practically the operation of simple circuits containing resistors, variable resistors, ~~diodes and other non-ohmic devices~~ • describe energy transfers and transformations with reference to resistors, light bulbs, ~~diodes~~, thermistors, light dependent resistors (LDRs), ~~light-emitting diodes (LEDs) and~~ potentiometers in common devices			finish 13/12

Wk	Topic	Key knowledge	Learning activities	Assessment tasks and opportunities	Other dates
Term 1					
1	**JanCon** 24/1, 25/1 and 27/1				26/1 Australia Day
2	Using electricity	• investigate and apply theoretically and practically concepts of current, resistance, potential difference (voltage drop) and power to the operation of electronic circuits comprising resistors, light bulbs, diodes, thermistors, light dependent resistors (LDRs), light-emitting diodes (LEDs) and potentiometers (quantitative analysis restricted to use of $I = \frac{V}{R}$ and $P = VI$) • investigate practically the operation of simple circuits containing resistors, variable resistors, diodes and other non-ohmic devices • describe energy transfers and transformations with reference to resistors, light bulbs, diodes, thermistors, light dependent resistors (LDRs), light-emitting diodes (LEDs) and potentiometers in common devices	Expt: Investigating resistance of thermistors Expt: I-V characteristics of an LED		Students commence
3				**Transition Test (Formative)**	



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4	Electrical safety in the home	• model household (AC) electrical systems as simple direct current (DC) circuits • model household electrical connections as a simple DC circuit comprising fuses, switches, circuit breakers, loads and earth • compare the operation of safety devices including fuses, circuit breakers and residual current devices (RCDs) • describe the causes, effects and first aid treatment of electric shock and identify the approximate danger thresholds for current and duration	Case study: Electric shock first aid	**AOS 1 Pre-test: Light and Heat**	
5	Review and assessment			**AT 1.3 AOS 3 Test: Electric circuits (Wed 22/2)**	SS House swimming 18/2
6	Electromagnetic radiation	• identify all electromagnetic waves as transverse waves travelling at the same speed, c, in a vacuum as distinct from mechanical waves that require a medium to propagate • identify the amplitude, wavelength, period and frequency of waves • calculate the wavelength, frequency, period and speed of travel of waves using: $\lambda = \frac{v}{f} = vT$ • explain the wavelength of a wave as a result of the velocity (determined by the medium through which it travels) and the frequency (determined by the source) • describe electromagnetic radiation emitted from the Sun as mainly ultraviolet, visible and infrared • compare the wavelength and frequencies of different regions of the electromagnetic spectrum, including radio, microwave, infrared, visible, ultraviolet, x-ray and gamma, and compare the different uses each has in society • investigate and analyse theoretically and practically the behaviour of waves including: – refraction using Snell's Law: $n_1 \sin(\theta_1) = n_2 \sin(\theta_2)$ and $n_1 v_1 = n_2 v_2$ – total internal reflection and critical angle including applications: $n_1 \sin(\theta_c) = n_2 \sin(90°)$ • investigate and explain theoretically and practically colour dispersion in prisms and lenses with reference to refraction of the components of white light as they pass from one medium to another • explain the formation of optical phenomena: rainbows; mirages – investigate light transmission through optical fibres for communication	Modelling/Simulation: Slinkies and simulations Lit review: Properties of the EM spectrum Expt: Snell's Law and Critical Angle Expt: The effect of temperature on refractive index		
7					
8	Thermal Energy	• convert between Celsius and kelvin scales • describe how an increase in temperature corresponds to an increase in thermal energy (kinetic and potential energy of the atoms) of a system: – distinguish between conduction, convection and ~~radiation~~ with reference to heat transfers within and between systems – explain why cooling results from evaporation using a simple kinetic energy model • investigate and analyse theoretically and practically the energy required to: – raise the temperature of a substance: $Q = mc\Delta T$ • change the state of a substance: $Q = mL$	Expt: Demonstrating conduction and convection Expt: Heating water Expt: Latent heat of stearic acid	**Logbook (formative)**	Labour Day Mon 13/3
9					House Athletics Mon 20/3 Ramadan starts 23/3

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10	Interaction of thermal energy and electromagnetic radiation	• describe how an increase in temperature corresponds to an increase in thermal energy (kinetic and potential energy of the atoms) of a system: – distinguish ~~between conduction, convection and~~ radiation with reference to heat transfers within and between systems • calculate the peak wavelength of the radiated electromagnetic radiation using Wien's Law: $\lambda max T$ = constant • compare the total energy across the electromagnetic spectrum emitted by objects at different temperatures • apply concepts of energy transfer, energy transformation, temperature change and change of state to climate change and global warming.	Simulation: Wien's Law and Stephan-Boltzmann Law Modelling: Modelling the greenhouse effect	**AT 1.1 – Light and Heat (Tue 28/3)**	
11	Review and assessment			**AOS 1 Test: Light and Heat**	Good Friday 7/4
Term 2					
Wk	Topic	Key knowledge	Learning activities	Assessment tasks and opportunities	Other dates
1	Radiation from the nucleus	• explain nuclear stability with reference to the forces in the nucleus including electrostatic forces, the strong nuclear force and the weak nuclear force • model radioactive decay as random decay with a particular half-life, including mathematical modelling with reference to whole half-lives • describe the properties of α, β-, β+ and γ radiation • explain nuclear transformations using decay equations involving α, β-, β+ and γ radiation • analyse decay series diagrams with reference to type of decay and stability of isotopes • explain the effects of α, β and γ radiation on humans, including: – different capacities to cause cell damage – short- and long-term effects of low and high doses – ionising impacts of radioactive sources outside and inside the body – calculations of absorbed dose (gray), equivalent dose (sievert) and effective dose (sievert) • evaluate the use of medical radioisotopes in therapy including the effects on healthy and damaged tissues and cells	Prac: Investigating radiation Modelling: Modelling half life Simulations		Ramadan ends 24/4 Anzac Day 25/4
2					
3	Nuclear energy	• explain, qualitatively, nuclear energy as energy resulting from the conversion of mass • explain fission chain reactions including: – the effect of mass and shape on criticality – neutron absorption and moderation • compare the processes of nuclear fusion and nuclear fission	Modelling: Fission chain reactions		

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4	Research Task	• Use secondary sources to investigate a device that uses nuclear energy • Develop research skills	Library session/s		
5	Nuclear energy	• explain, using a binding energy curve, why both fusion and fission are reactions that release energy • investigate the viability of nuclear energy as an energy source for Australia.		**AT 1.2 Nuclear Physics Research Task (Tue 23/5)**	
6	Exam Revision				Year 10-12 exams (Fri 2/6)
7	Exams			**Unit 1 Exam**	Year 10-12 exams Report Writing Day Fri 9/6
8	Concepts used to model motion	• identify parameters of motion as vectors or scalars • analyse graphically, numerically and algebraically, straight-line motion under constant acceleration: $v = u + at,\ v^2 = u^2 + 2as,\ s = \frac{1}{2}(u + v)t,\ s = ut + \frac{1}{2}at^2,\ s = vt - \frac{1}{2}at^2$ • analyse, graphically, non-uniform motion in a straight line	Expt: Measuring speed and velocity Use data loggers to measure motion		King's Bday 12/6
9					House X-country Mon 29/6
Term 3					
Wk	Topic	Key knowledge	Learning activities	Assessment tasks and opportunities	Other dates
1	Forces and motion	• model the force due to gravity, F_g, as the force of gravity acting at the centre of mass of a body, $F_{\text{on body by Earth}} = mg$, where g is the gravitational field strength (9.8 N kg^{-1} near the surface of Earth) • model forces as vectors acting at the point of application (with magnitude and direction), labelling these forces using the convention 'force on A by B' or $F_{\text{on A by B}} = -F_{\text{on B by A}}$ • apply Newton's three laws of motion to a body on which forces act: $a = \frac{F_{net}}{m}$, $F_{\text{on A by B}} = -F_{\text{on B by A}}$ • apply the vector model of forces, including vector addition and components of forces, to readily observable forces including the force due to gravity, friction and normal forces	Expt: F=ma Expt: Balancing forces		JuloCon Mon 10/6
2					
3	Energy and motion	• apply the concept of work done by a force using: – work done = force × displacement: $W = Fs\cos\theta$, where force is constant – work done = area under force vs distance graph • investigate and analyse theoretically and practically Hooke's Law for an ideal spring: $F = -kx$, where x is extension	Expt: Hooke's Law Expt: Conservation of Energy	Formative TBA	

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4	Energy and motion	• analyse and model mechanical energy transfers and transformations using energy conservation: – changes in gravitational potential energy near Earth's surface: $E_g = mg\Delta h$ – elastic potential energy in ideal springs: $E_s = \frac{1}{2}kx^2$ – kinetic energy: $E_k = \frac{1}{2}mv^2$ • analyse rate of energy transfer using power: $P = \frac{E}{t}$ • calculate the efficiency of an energy transfer system: $\eta = \frac{\text{useful energy out}}{\text{total energy in}}$			
5	Momentum Application of motion	• apply concepts of momentum to linear motion: p = mv • explain changes in momentum as being caused by a net force: $\Delta p = F_{net}\Delta t$ • analyse impulse in an isolated system (for collisions between objects moving in a straight line): $F\Delta t = m\Delta v$ • investigate and analyse theoretically and practically momentum conservation in one dimension • investigate the application of motion concepts through a case study, for example, through motion in sport, vehicle safety, a device or a structure.	Expt: Momentum and collisions		House Music Tues 8/8
6				AT 2.1 Motion TBA (Tues 15/8)	Curric. Day Mon 14/8
7	Equilibrium	• calculate torque, $\tau = r_{\perp} F$ • analyse translational and rotational forces (torques) in simple structures in translational and rotational equilibrium			
8	Options	Students select from 18 options to explore the related physics and use this physics to form a stance, opinion or solution to a contemporary societal issue or application. In their explorations, a range of investigation methodologies may be used by students.			
9					
Term 4					
Wk	Topic	Key knowledge	Learning activities	Assessment tasks and opportunities (TBC)	Other dates
0	Unit 3/4 VCE/Y12 IB Practise Exams				

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1	Investigation design	• apply the physics concepts specific to the selected investigation and explain their significance, including definitions of key terms, and physics representations • evaluate the characteristics of the scientific methodology relevant to the investigation, selected from: experiment; fieldwork, classification and identification, modelling, simulation, and the development of a product, process or system • apply techniques of primary qualitative and quantitative data generation relevant to the investigation • identify and apply concepts of accuracy, precision, repeatability, reproducibility, resolution, and validity of data in relation to the investigation • identify and apply health, safety and ethical guidelines relevant to the selected scientific investigation	Plan student investigation	AT 2.2 Options Tues 3/10	
2	Scientific evidence	• distinguish between an aim, a hypothesis, a model, a theory and a law • identify and explain observations and experiments that are consistent with, or challenge, current models or theories • describe the characteristics of primary data • evaluate methods of organising, analysing and evaluating primary data to identify patterns and relationships including scientific error, causes of uncertainty, and limitations of data, methodologies and methods • model the scientific practice of using a logbook to authenticate generated primary data	Plan student investigation	Formative	Yr 12 final day of classes Fri 13/10
3	Student investigation				
4	Science communication	• apply the conventions of scientific report writing including scientific terminology and representations, standard abbreviations, units of measurement, significant figures and acknowledgement of references • apply the key findings of the selected investigation and their relationship to key physics concepts.			
5	Exam revision			**AT 2.3 Scientific Poster Tues 31/10**	
6					Mid-term holiday Mon 6/11 Melb. Cup Tue 7/11
7	Exams			**Unit 2 Exam**	Year 11 Exams
8	Transition				Transition
9					
0					
11					Students finish Tue 12/9