**Sample Course Outline**

Physics

General Year 12

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# Sample course outline

# Physics – General Year 12

## Unit 3 and Unit 4

### Science Inquiry Skills

Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated into the learning experiences for Units 3 and 4.

* identify, research, construct and refine questions for investigation; propose hypotheses; and predict possible outcomes
* plan, select and use appropriate [investigation](http://www.australiancurriculum.edu.au/Glossary?a=S&t=Investigation) methods, including [preliminary](http://www.australiancurriculum.edu.au/Glossary?a=S&t=Field%20work) trials, laboratory experimentation and controlling variables to collect reliable data
* assess risk and address ethical issues associated with these methods
* work collaboratively and individually to conduct investigations using appropriate measuring devices, safely, competently and methodically for the collection of valid and reliable data
* organise and clearly represent data in tables and appropriate graphs to identify trends, patterns and relationships
* describe sources of experimental error
* use appropriate SI units and symbols
* use evidence to make and justify conclusions
* evaluate conclusions by considering the quality of available evidence and make recommendations for improving experimental method
* communicate scientific ideas and information using appropriate scientific language, conventions and representations

## Semester 1 – Unit 3 – Moving

| **Week** | **Key teaching points** |
| --- | --- |
| 1–3 | * displacement, velocity, speed, distance, momentum
* acceleration is the rate of change of velocity
* solve simple problems using the equations:

  * uniform motion in one dimension can be represented graphically
* data used to describe motion can be collected using a range of technologies (SHE)

**Task 1:** Investigation: Measuring speed and acceleration |
| 4–6 | * forces and their effects, including pushes and pulls
* contact forces, including friction; and non-contact forces, including gravity
* forces have magnitude and direction
* free body diagrams show the forces acting on objects in one or two dimensions

**Task 2:** Test: Movement: velocity, acceleration, forces |
| 7–9 | * Newton’s First Law (also called the law of inertia)
* Newton’s Second Law explains the relationship between force and rate of change in momentum according to the equation *Ft = Δp = m(v-u)*
* Newton’s Second Law also relates force and acceleration according to the equation

*F = ma** The relationships above can be used to explain behaviour of objects in practical situations
* Newton’s Third Law of motion
* the effects of friction in everyday life (SHE)
* traffic accidents can be investigated to determine how road and weather conditions, driver reaction times and speed affect the severity of vehicle collisions (SHE)
* the principles behind safety measures, such as crash barriers, seatbelts, crumple zones (SHE)

**Task 3:** Investigation: Factors affecting the severity of collisions |
| 10–11 | * principles of physics can be applied to understand movement in sport (SHE)
* the force of gravity causes objects close to the Earth to accelerate at the same rate
* distinguish between mass and weight: This will include applying the relationship:

*F*weight = *mg** objects in free fall due to gravity experience apparent weightlessness

**Task 4:** Investigation: Factors affecting the flight of a water rocket **Task 5:** Extended response: Physics of a sport |
| 12–13 | * work done is equal to energy transferred: This will include applying the relationship: *W = Fs*
* kinetic energy is the energy of motion

**Externally set task** |
| 14–15 | * gravitational potential energy is the energy of position
* conservation of energy

**Task 6:** Test: Movement: Newton’s laws, work, energy |

## Semester 2 – Unit 4 – Electricity

| **Week** | **Key teaching points** |
| --- | --- |
| 1 | * static electricity – atoms can gain or lose electrons, so gaining a net charge; and like charges repel and unlike charges attract
* lightning as a natural example of charge build-up and discharge (SHE)
 |
| 2–3 | * electric current is the rate of flow of electric charge
* the direction of conventional current is that in which the flow of positive charge is considered to take place, while the electron flow is in the opposite direction
* electrical properties of conductors and insulators
* construct simple electrical circuits and measure current and potential difference at various points around the circuit using ammeters, voltmeters and multimeters
* draw and interpret simple circuit diagrams, including the standard symbols for resistor (fixed and variable), light globe, switch, ammeter, voltmeter, cell/battery, and power supply
 |
| 4–5 | * energy transformations, such as heating and lighting effects in electrical circuits
* current, voltage and resistance are related as shown in Ohm’s law: *V = IR*; as resistance increases, current decreases if voltage remains the same
* factors affecting resistance of a conductor – type of material, length, cross-sectional area
* high resistance conductors can be used to produce heat as in heating elements

**Task 7:** Investigation: The relationship between current and potential difference, factors affecting resistance |
| 6–7 | * the concepts of electrical current, potential difference and resistance in series and parallel circuits
* the effects of having resistors connected in series
* the effects of having resistors connected in parallel

**Task 8:** Test: Electricity: Ohm’s law, series and parallel circuits |
| 8–9 | * power is related to voltage and current. This will include applying the relationship:

*P = VI** the kilowatt hour is a unit of energy and is used to determine the cost of running electrical appliances
* efficient use of household electricity (SHE)
 |
| 10–11 | * magnetism and magnetic fields; like poles repel, unlike poles attract
* Earth’s magnetic field
* use of compass to plot magnetic fields
* origin of Earth’s magnetic field and its use for navigation (SHE)
* moving charges have magnetic fields
* a current carrying wire in a magnetic field has a force acting on it when it cuts flux lines. This is the principle behind the electric motor

**Task 9:** Investigation: The magnetic fields of magnets, wires, coils |
| 12–13 | * current is generated in a moving conductor when it cuts magnetic flux lines. This is the principle behind the generator
* the cause of short circuits and electric shock
* the protective role of earthing electrical circuits (SHE)
* identification of hazardous situations and the necessary safety precautions in everyday uses of electrical energy
* the principles behind the operation of various safety devices, such as fuses, RCDs, circuit breakers

**Task 10:** Extended response: Research your household’s use of electricity |
| 14–15 | * production of electric power using coal, gas, oil, solar furnace, wind, nuclear, geothermal, tidal, photovoltaics; and advantages and disadvantages of these methods (SHE)

**Task 11:** Test: Electric power, safety, magnetism |