# **PES Level 1 Course Outline 2**

# Guide to aid teacher planning only - designed to be printed or viewed in A3, Landscape.

## Purpose

This example Course Outline has been produced to help teachers and schools understand the new NCEA Learning and Assessment matrices, and could be used to create a year-long programme of learning. It will give teachers ideas of how the new standards might work to assess the curriculum at a particular level.

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| **Significant Learning** | **Learning activities and assessment opportunities**Throughout the year assessment for learning happens often. Evidence may also be collected for summative assessment. | **Duration** Total of 32 weeks |
| Use systematic and scientific processes, models, and other representations, to explain physics, Earth, and space science principles and explore how these processes are applied in a taiao context. Explore how different ways of applying models can strengthen the work of kaitiakitanga to restore mana and mauri to a system.Explore how energy transfers are involved in everyday interactions. Understand how the knowledge and significance of energy transfer has been passed down through pūrākau and tikanga practices. Learn how these same science concepts are still being applied to a variety of te ao Māori activities today | **It’s all about energy: considering electricity and magnetism through interactions with the physical world*** Explore DC circuits (series and simple parallel circuits), Ohm’s Law, and power.
* Learn about electrical protection for house wiring.
* Investigate [conductors and insulators](https://www.sciencelearn.org.nz/resources/2745-electricity-electrons-insulators-and-conductors) for charge separation.
* Solve simple V = IR and P = VI calculations.
* Explore and represent [magnetic fields](https://www.sciencelearn.org.nz/resources/2562-introducing-magnetism).

**Opportunity for assessment of AS 1.2 Demonstrate understanding of a physics phenomenon in the taiao through modelling, and formative assessment of AS 1.4 Demonstrate understanding of physics concepts in the taiao** | 5 weeks |
| Explore how energy transfers are involved in everyday interactions. Understand how the knowledge and significance of energy transfer has been passed down through pūrākau and tikanga practices. Learn how these same science concepts are still being applied to a variety of te ao Māori activities todayUnderstand that the total amount of energy is maintained when it is transferred during an event. Te ao Māori acknowledges the interconnectedness and interrelationship of all living and non-living things. Understand the cultural significance to Māori of seeking to understand the total system, and the role energy conservation plays in it.Understand that the taiao is centred on mauri, and encompassed and maintained by kaitiakitanga, and described in science as consisting of interacting spheres - the hydrosphere, biosphere, atmosphere, and geosphere. | **Staying warm and keeping cool: implications of thermal energy use, from a personal to a global scale*** Investigate insulators that keep cold things cold, and [warm things warm](https://www.sciencelearn.org.nz/resources/1006-insulation) (eg simple conduction and convection practical investigations).
* Consider the implications of household insulation. Why are warmer houses [healthier](https://toiteora.govt.nz/public/healthy-homes/)?
* Learn about the different ways fire has [traditionally](https://nzase.org.nz/wp-content/uploads/2021/08/2021-08-Teaching-fire-making-NZASE-resource.pdf) been used. How did people find out which wood burned the best?
* Consider how [geothermal energy](https://www.sciencelearn.org.nz/resources/1573-geothermal-power) continues to impact our lives.
* Understand the difference between [climate and weather](https://www.sciencelearn.org.nz/resources/2966-weather-and-climate).
* Explore how [traditional knowledge](https://niwa.co.nz/education-and-training/schools/teaching-resources/rangi-weather-and-climate-lessons-for-teachers/lesson-9-ng%C4%81-tohu-o-te-taiao) of [climate and weather](https://www.sciencelearn.org.nz/resources/2961-maori-ways-of-knowing-weather-and-climate) developed in Aotearoa New Zealand. How was this tested?
* Recognise that weather and climate are found in the lower part of the atmosphere; the [troposphere](https://niwa.co.nz/education-and-training/schools/students/layers).
* Investigate how [clouds](https://www.sciencelearn.org.nz/resources/628-observing-clouds-and-weather) are formed and how they can be used to predict the weather.

**Opportunity for assessment of AS 1.1 Demonstrate understanding of human-induced changes within the Earth system*, and* formative assessment of AS 1.4 Demonstrate understanding of physics concepts in the taiao** | 5 weeks |
| Use systematic and scientific processes, models, and other representations, to explain physics, Earth, and space science principles and explore how these processes are applied in a taiao context. Explore how different ways of applying models can strengthen the work of kaitiakitanga to restore mana and mauri to a system.Understand that forces have an effect on the motion of objects in the taiao. In a variety of contexts, including te ao Māori, understand how the application of forces and its effect on motion has been used effectively in the past and is also being used effectively in the present.  | **Getting moving: transportation plays a large role in the way we live and work, and how we move around the country** * Consider both [traditional](https://www.sciencelearn.org.nz/topics/navigation) and current modes of transportation on the water.
* Carry out simple investigations into [distance and time](https://www.sciencelearn.org.nz/resources/2717-an-investigation-of-motion), with respect to constant speed.
* Calculate speed from distance-time graphs.
* Draw force diagrams for objects moving at constant acceleration.
* Use Newton’s Laws to explain the motion of objects.
* Compare mechanical and electrical power.
* Consider basic forces in relation to a number of different modes of transportation, eg sailing, automobiles, trains, [planes](https://www.sciencelearn.org.nz/resources/299-principles-of-flight). How was the wind used to cross the [Pacific](https://teara.govt.nz/en/pacific-migrations/page-5)?

**Opportunity for formative assessment of AS 1.4 Demonstrate understanding of physics concepts in the taiao**  | 5 weeks |
| Describe interactions between the Sun and Earth-Moon system. Explore how people can use tātai arorangiandkaitiakitanga to inform their actions.Explain how maramataka is used to gain mōhiotanga of tātai arorangi as we describe interactions between the sun and Earth-Moon systems and their effect on planet Earth. | **How do the Sun and the Moon impact our day-to-day lives?*** Choose from a variety of learning activities (depending on the time of year), for example:
	+ explore the daytime surface temperature relative to the day/night cycle
	+ understand how the [different seasons](https://niwa.co.nz/rangi/lesson-5-introduction-to-climate#why) are influenced by:
		- the tilt of the Earth
		- the orbit of the Earth around the Sun
		- latitude
		- the amount of solar energy hitting the Earth’s surface
	+ use models of the Sun and Earth to investigate how the angle of the Sun can affect temperature
	+ measure the [length of shadows](https://www.sciencelearn.org.nz/resources/2791-building-science-concepts-shadows) and/or the temperature of sand at different times of the day or during different seasons.
	+ investigate the interactions of the Sun, Earth, and Moon in the formation of tides, including neap, spring, and king tides.
* Consider the [importance](https://www.sciencelearn.org.nz/resources/1747-using-solar-energy) of the Sun from a number of perspectives, including te ao [Māori](https://teara.govt.nz/en/te-ao-marama-the-natural-world/page-1) perspectives of [celestial bodies](https://teara.govt.nz/en/ranginui-the-sky/page-4).

**Opportunity for formative assessment of AS 1.3 Demonstrate understanding of the effects on planet Earth of interactions between the Sun and the Earth-Moon system** | 4 weeks |
| Understand that the taiao is centred on mauri, and encompassed and maintained by kaitiakitanga, and described in science as consisting of interacting spheres - the hydrosphere, biosphere, atmosphere, and geosphere.Examine interactions between the hydrosphere, biosphere, atmosphere, and geosphere. Through aspects of whakapapa, consider how these interactions are woven into te ao Māori.Explore the effects of natural, and human-induced changes to the taiao. Explore how mauri is an essential part of the natural and human-constructed world and how it is essential to maintain or restore mauri. | **Climate change*** Investigate [interactions](https://www.sciencelearn.org.nz/resources/1256-what-is-the-earth-system) between the geosphere, hydrosphere, and atmosphere. Why is our climate [warming](https://www.sciencelearn.org.nz/videos/1990-climate-change-a-warming-world)?
* Learn about the transformation of energy that occurs when incoming sunlight ([short wave solar radiation](https://niwa.co.nz/our-science/climate/information-and-resources/clivar/greenhouse)) hits the Earth’s surface. What effect does the outgoing heat (long-wave infra-red radiation) from the Earth’s surface have on the atmosphere?
* Explore the normal [greenhouse effect](https://www.sciencelearn.org.nz/resources/1004-greenhouse-effect), and how it affects Earth’s average temperature, and the enhanced greenhouse effect, where excess CO2 in the atmosphere is warming the Earth system.
* Investigate the [natural events and human activities](https://environment.govt.nz/facts-and-science/climate-change/science-of-climate-change/#different-types-of-emissions-affect-the-climate-differently) that produce the large amounts of CO2 entering the atmosphere, for example:
	+ volcanic eruptions in Aotearoa New Zealand and the Pacific (natural)
	+ over-use of [fossil fuels](https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2019-snapshot/key-findings-of-the-2021-inventory/) (human)
	+ concrete production (human).
* Understand how [volcanoes](https://www.sciencelearn.org.nz/topics/volcanoes) form by exploring how Aotearoa New Zealand straddles two colliding tectonic plates. Identify, and recognise the significance of, [pūrākau](https://www.learnz.org.nz/sites/learnz.org.nz/files/LEARNZ%20Virtual%20Field%20Trip%20-%20Ngatoroirangi2.pdf) that relate to natural disasters.
* Learn about what fossil fuels are, how they are [formed](https://www.sciencelearn.org.nz/videos/800-oil-formation) over time, and why humans use them so much. How is the burning of fossil fuels causing [human-induced temperature rises](https://www.sciencelearn.org.nz/resources/2956-human-contributions-to-climate-change-how-we-know)?
* Consider the [implications](https://niwa.co.nz/education-and-training/schools/students/climate-change/impacts-for-NZ) of increasing temperatures (as a result of climate change) on the Earth system. For example:
	+ more frequent and stronger weather events
	+ [sea level rise](https://www.sciencelearn.org.nz/resources/2277-climate-change-melting-ice-and-sea-level-rise)
	+ [ocean acidification](https://niwa.co.nz/news/investigating-ocean-acidification).
* Explore how [kaitiakitanga](https://www.sciencelearn.org.nz/resources/2544-understanding-kaitiakitanga) be used to mitigate the effects of climate change.
* What are the legal implications for traditional uses of land, air, and water?

**Opportunity for assessment of 1.1 Demonstrate understanding of human-induced changes within the Earth system, and formative assessment of 1.3 Demonstrate understanding of the effects on planet Earth of interactions between the Sun and the Earth-Moon system**  | 5 weeks |
| Understand that the taiao is centred on mauri, and encompassed and maintained by kaitiakitanga, and described in science as consisting of interacting spheres - the hydrosphere, biosphere, atmosphere, and geosphere. | **Renewable energy in Aotearoa New Zealand*** Learn about the [history](https://www.eea.co.nz/Site/about/electricity-Industry/125-years.aspx) and [future](https://www.nzstory.govt.nz/stories/renewable-electricity/) of electrical generation in Aotearoa New Zealand.
* Consider the [environmental impacts](https://www.environmentguide.org.nz/activities/renewable-energy/) of renewable energy sources in Aotearoa New Zealand.
* Identify and learn about the [renewable energy sources](https://www.sciencelearn.org.nz/resources/1571-renewable-energy-sources) found in Aotearoa New Zealand.
* Investigate the [amount of electricity](https://www.energymix.co.nz/our-consumption/new-zealands-consumption/) that is generated from hydro, wind, and geothermal sources.
* Understand [how electricity is used in our homes](https://www.ea.govt.nz/about-us/media-and-publications/electricity-new-zealand/), including simple circuits.
* Investigate the energy sources used historically by [Māori](https://teara.govt.nz/en/energy-supply-and-use/page-2) and [Pacific](https://manoa.hawaii.edu/ctahr/pacificfoodguide/index.php/about-the-guide/food-production/) peoples.
* Learn about [Tāwhirimātea](https://teara.govt.nz/en/tawhirimatea-the-weather/print) and recognise why this deity is important for understanding climate and ocean currents in te ao Māori.

**Opportunity for assessment of AS 1.2 Demonstrate understanding of a physics phenomenon in the taiao through modelling, and formative assessment of AS 1.4 Demonstrate understanding of physics concepts in the taiao** | 4 weeks |
| Use systematic and scientific processes, models, and other representations, to explain physics, Earth, and space science principles and explore how these processes are applied in a taiao context. Explore how different ways of applying models can strengthen the work of kaitiakitanga to restore mana and mauri to a system. | **The Sun and the Earth: what is the nature of light?*** Consider the [electromagnetic spectrum](https://www.sciencelearn.org.nz/image_maps/63-the-electromagnetic-spectrum), with particular focus on visible light, infra-red, and UV.
* Use c=f.lambda to consider the relationship between frequency and wavelength for visible light.
* Complete [practical investigations](https://www.sciencelearn.org.nz/topics/light-and-colour?type=activities) to consider simple [reflection and refraction of white light](https://www.sciencelearn.org.nz/resources/39-light-and-sight-introduction).

**Opportunity for assessment of AS 1.2 Demonstrate understanding of a physics phenomenon in the taiao through modelling** | 4 weeks |