

## Physics

(ATAR)

**Pre-requisite:** a 'B' grade or better in Year 10A Mathematics is highly recommended and a 'C' grade or better in Year 10 Science is highly recommended

Students must also study Mathematics Methods ATAR in order to study Physics ATAR. In the Physics ATAR course students will learn how energy and energy transformations can shape the environment from the small scale, in quantum leaps inside an atom's electron cloud, through the human scale, in vehicles and the human body, to the large scale, in interactions between galaxies.

Students have opportunities to develop their investigative skills and use analytical thinking to explain and predict physical phenomena. Students plan and conduct investigations to answer a range of questions, collect and interpret data and observations, and communicate their findings in an appropriate format.

Problem-solving and using evidence to make and justify conclusions are transferable skills that are developed in this course.

## Course Structure

### Year 11

#### Unit 1 – Thermal, nuclear and electrical physics

- In this unit, students explore the ways physics is used to describe, explain and predict the energy transfers and transformations that are pivotal to modern industrial societies.
- Students investigate heating processes, apply the nuclear model of the atom to investigate radioactivity, and learn how nuclear reactions convert mass into energy.
- Contexts that can be investigated in this unit include technologies related to nuclear, thermal, or geothermal energy, the greenhouse effect, electrical energy production, large-scale power systems, radiopharmaceuticals, and electricity in the home; and related areas of science, such as nuclear fusion in stars and the Big Bang theory.
- Students develop skills in interpreting, constructing and using a range of mathematical and symbolic representations to describe, explain and predict energy transfers and transformations in heating processes, nuclear reactions and electrical circuits.

#### Unit 2 – Linear motion and waves

- Students develop an understanding of motion and waves which can be used to describe, explain and predict a wide range of phenomena. Students describe linear motion in terms of position and time data, and examine the relationships between force, momentum and energy for interactions in one dimension.
- Students investigate common wave phenomena, including waves on springs, and water, sound and earthquake waves.
- Contexts that can be investigated in this unit include technologies such as accelerometers, motion detectors, global positioning systems (GPS), energy conversion buoys, music, hearing aids, echo locators, and related areas of science and engineering, such as sports science, car and road safety, acoustic design, noise pollution, seismology, bridge and building design.

## Year 12

### Unit 3 – Gravity and electromagnetism

- In this unit, students develop a deeper understanding of motion and its causes by using Newton's Laws of Motion and the gravitational field model to analyse motion on inclined planes, the motion of projectiles, and satellite motion.
- They investigate electromagnetic interactions and apply this knowledge to understand the operation of direct current motors, direct current (DC) and alternating current (AC) generators, transformers, and AC power distribution systems. Students also investigate the production of electromagnetic waves.
- Contexts that can be investigated in this unit include technologies, such as artificial satellites, navigation devices, large-scale power generation and distribution, motors and generators, electric cars, synchrotron science, medical imaging, and related areas of science and engineering, such as sports science, amusement parks, ballistics and forensics.

### Unit 4 – Revolutions in modern physics

- In this unit, students examine observations of relative motion, light and matter that could not be explained by existing theories, and investigate how the shortcomings of existing theories led to the development of the special theory of relativity and the quantum theory of light and matter.
- Students evaluate the contribution of the quantum theory of light to the development of the quantum theory of the atom, and examine the Standard Model of particle physics and the Big Bang theory.
- Contexts that can be investigated in this unit include technologies, such as photo radar, fibre optics, DVDs, GPS navigation, lasers, modern electric lighting, medical imaging, nanotechnology, semiconductors, quantum computers and particle accelerators, and astronomical telescopes such as the Square Kilometre Array. Other contexts may include black holes, dark matter, and related areas of science, such as space travel and the digital revolution.