



## Ken Silburn and Cherine Spirou introduce the new Science courses to be implemented for Year 11 in 2018 and Year 12 in 2019...

Considering the last major syllabus changes were in 2010, the current revisions of the Stage 6 Science courses are well overdue, and present new opportunities for teachers to review their programs and teaching.

In March 2017, the NSW Education Standards Authority - NESAs (formerly BOSTES), announced the implementation dates for the new HSC Science syllabuses, after nearly two years of consultation with schools from all educational sectors.

In 2018, the implementation of the Year 11 courses in Science will begin. It is, therefore, crucial for teachers to begin familiarising themselves with the new syllabuses and to begin programming.

### Structure and organisation

While the current syllabuses are organised in core and option topics, the new syllabuses have removed the option topics and included the most popular content and options into the modules. The new syllabuses are organised into Modules and the content descriptors are focussed primarily on Working Scientifically outcomes and inquiry questions.

The patterns of study for Science are also changed. Students can now study up to 7 units of Science in Year 12, as there is a Science Extension course in development, which should be finalised for implementation in 2019.

The HSC lineup maintains the traditional courses of Physics, Chemistry, Biology, Earth and Environmental Science, and Life Skills. There is also a new course, Investigating Science, and there is no longer a Senior Science course. Investigating Science can be studied as a standalone course or in conjunction with any other Science course in Year 11 (whereas this was not possible with Senior Science). Further, any of the Science courses can be studied in combination to make up 6 units of Science, as there are no exceptions with the new syllabus.

### New assessment guidelines

Also, with the Stronger HSC Standards, come new assessment guidelines. The mandated assessment guidelines are available through [NESAs](#), and teachers are advised to refer to these guidelines to keep up to date with requirements.

At this stage, Year 11 must have three (3) assessment tasks and Year 12 may have up to a maximum of four (4) assessment tasks. Only one of those tasks may be a formal examination.

The mandatory component weighting for both the Year 11 and Year 12 assessment is 60% for skills in Working Scientifically and 40% for Knowledge and Understanding of course content.



In Year 11, the guidelines are that schools must ensure the formal school-based assessment, as well as restricted to three tasks, includes a focus on a depth study or an aspect of a depth study with a weighting of 20–40%. Only one task may take the form of a written examination. Each assessment task is required to have a weighting between 20–40%.

Year 12 assessment guidelines are similar with the additional assessment tasks to include a maximum of four tasks with the range weighting to be between 10–40%.

## Investigating Science

Investigating Science is a new course with a focus on the applications of science. It is important to stress that it is a new course and not a replacement for the Senior Science course. Investigating Science is a two-year course. As with the other new science courses, it is a 'Category A' course and can be taken as a standalone subject or as a complement to other Science courses.

Students will have the opportunity to focus on the methodology of science and the place of science in society.

### Course modules:

Year 11	Year 12
Observing	Scientific Investigations
Inferences and Generalisations	Technologies
Scientific Models	Fact or Fallacy
Theories and Laws	Science and Society

Investigating Science will provide students with opportunities to:

- Build on the knowledge, understanding and skills of Stage 5 Science;
- Apply Working Scientifically outcomes in an integrated way;
- Design and conduct practical investigations;
- Participate in fieldwork in Year 11 and Year 12.

Students may also be able to learn about:

- Observations of Archimedes, Alexander Fleming and Galileo;
- Practices of Aboriginal and Torres Strait Islander Peoples in relation to their application of scientific principles;



- Use of models in science;
- Distinction between scientific theories and laws;
- Using Science to test claims;
- How science affects the development of new technologies.

## Science Extension

Updates and implementation advice for the new Science Extension syllabus, which is still in development, can be found at [NESA's website](#).

The course is intended to be designed for students who have attained a high level of achievement in one or more of the Science disciplines in Year 11 and are planning to pursue further study in Science, Technology, Engineering or Mathematics (STEM) based courses offered at the tertiary level.

Students are likely to be challenged to examine a scientific research question drawn from one or more of the scientific disciplines of Biology, Chemistry, Earth and Environmental Science and Physics. In doing this students extend their knowledge of the discipline(s), conduct further analysis and authentic investigations and, uniquely for this course, produce a detailed scientific research report that reflects the standards generally required for publication in a scientific journal.

## What to lookout for...

Teachers need to realise that although there is some content that is overlapping from the current syllabus into the new Science syllabus, it is imperative that they are aware of the new content and program accordingly.

With the Stronger HSC Standards being implemented, this has translated into more academically rigorous courses in both Chemistry and Physics, which will provide opportunities for students to work at a higher mathematical level than in previous years.

## Depth studies

The introduction of depth studies in Year 11 and in Year 12 provides opportunities to investigate areas of interest in more depth. Contexts have been removed to provide flexibility for teaching content.

There is some guidance for each course provided though [NESA Support Materials](#) and more assistance and direction will be necessary to support teachers in both the delivery and assessment of the depth studies.

These studies are mandatory and need to be assessed with a weighting of between 20–40% of the school-based assessment. While the depth study may be undertaken either within a single module of the course or across modules, the formal assessment of a depth study, or aspect of the study, must only occur once. This may include written reports, oral presentations, digital or multimedia products, data analysis, practical investigations or fieldwork.



Each of the HSC Science courses requires that 15 hours of school time is used to complete the depth study per year, with the exception of Investigating Science which requires 30 hours.

NESA outlines the depth study may be a single investigation/activity or series of investigations/activities and may be designed for the course cohort or a single class or be specific to the needs of an individual student.

### *Changes to individual courses*

#### **Biology**

New content includes:

- Cell requirements relating to light energy and chemical energy;
- Investigating extinction events;
- Aboriginal and Torres Strait Islander Peoples, paleontological and geological evidence of past changes in ecosystems;
- Single Nucleotide Polymorphism;
- Gene flow and genetic drift;
- Disease as a disruption of homeostasis;
- Pharmaceuticals and the control of infectious diseases;
- Aboriginal and Torres Strait Islander Peoples' protocols for medicines.

#### **Physics**

New content includes:

- Analysis of forces and motion in two dimensions using vectors;
- Standing waves;
- The Doppler effect;
- Elementary thermodynamics;
- Wave and quantum models of light;
- Standard Model of matter.

#### **Chemistry**

New content includes:

- Electronic configuration and spdf notation;
- The Bohr and Schrodinger models;
- The Ideal Gas Law;
- Enthalpy and Hess's Law;
- Entropy and Gibbs Free Energy;
- Aboriginal and Torres Strait Islander Peoples' applications of chemical practices;
- Calculating the Equilibrium Constant;
- Analysis of organic compounds.



### Earth and Environmental Science

New content includes:

- Strengthened links to geological exploration and mining;
- Climate science;
- Mitigation and adaptation strategies for a changing environment;
- An increased focus on sustainability.

With any new syllabus comes an opportunity to rethink and refine teaching practices, resources and programs. Teachers are encouraged to engage in professional learning and collaboration with colleagues within and across schools to prepare for these new courses and the possibilities they might bring for our students.

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