

VCE Algorithmics Units 3 & 4

VCE Algorithmics is a 'Higher Education Scored Study', which means that it's designed to be the equivalent of a first-year university subject. Students can attain a VCE study score for Algorithmics with some universities offering accelerated pathways and credits for successful completion.

Algorithmics provides a structured framework for solving real-world, practical problems with computational methods. It is fundamental to computer science and software engineering and is essential for understanding the technical underpinnings of our information society. Further, it provides a methodical way to approach complex problem-solving in STEM (Science, Technology, Engineering and Mathematics) and other disciplines that benefit from analytical problem-solving and formal reasoning. Computing is central to our society and economy and drives innovation across many fields of human endeavour.

VCE Algorithmics examines how information about the world can be systematically represented and how the processes can be made precise enough to be implemented in a computer program. The focus is not on coding but on 'algorithmic thinking'. Algorithmics covers systematic methods for analysing real-world problems and identifying the key aspects that need to be modelled to find a solution.

Algorithmics also covers deeper topics in computer science such as artificial intelligence, statistical methods of computation, and ethical issues related to these topics. This investigation of theoretical topics is complemented by the development of skills in a high-level programming language.

Structure

The study is made up of two units which must be taken in a sequence:

Unit 3: Algorithmic problem solving

Unit 4: Principles of algorithmics

Prerequisites

There isn't a Unit 1&2 Algorithmics; there is only the Algorithmics Units 3 & 4 sequence. However, students must be currently enrolled in or have already successfully completed *VCE Mathematical Methods Units 1 & 2* in order to enrol in VCE Algorithmics Unit 3. Students can apply to study Algorithmics in Year 11 or Year 12.

Course content

Unit 3: Algorithmic problem-solving

This unit focuses on how algorithms are used for solving complex problems.

Area of Study 1 — students develop and apply a range of knowledge and skills to model real-world information problems.

Area of Study 2 — students learn how to design algorithms following a variety of simple algorithm design patterns and learn to graph algorithms.

Area of Study 3 — students apply the understanding developed in Areas of Study 1 and 2 to design a solution for a real-world problem that includes both a data representation and algorithm design.

Unit 4: The principles of algorithms

This unit focuses on the performance of algorithms and the scope and limitations of algorithms.

Area of Study 1 — students study the efficiency of algorithms and techniques for the formal analysis of algorithms and learn to apply these techniques.

Area of Study 2 — students learn about a variety of more sophisticated algorithm design patterns and apply their knowledge of these to construct an improved solution for the problem solved in Unit 3.

Area of Study 3 — students learn about modern data-driven computation and the existence of hard limits of computability.

Pathways

VCE Algorithmics provides students with an understanding of skills necessary to succeed in careers that involve Computer Science and Software Engineering.

Further information: www.ches.vic.edu.au

VCE Extended Investigation Units 3 & 4

VCE Extended Investigation enables students to develop, refine and extend knowledge and skills in independent research and to carry out an investigation that focuses on a rigorous research question. The investigation may be an extension of an area of curriculum already studied or it may be completely independent of any other subject in the student's VCE program.

Through this subject students develop their capacity to explore, justify and defend their research findings in both oral and written forms to an educated non-specialist audience. Students develop and construct a research question, understand and apply ethical and robust research methods, explore a chosen area of investigation in depth, conduct a review of relevant literature, develop skills in research project management, rigorously analyse and evaluate findings and results, develop skills in written and oral presentation of research findings, and develop as independent, critical and reflective learners.

Aspects of critical thinking such as analysing, evaluating and synthesising information and reasoning logically are integral to the process of formulating and developing an investigation. As well as critiquing the strengths and the weaknesses of the arguments and conclusions of other researchers, students also need to apply critical thinking to their research question, methodology and research findings.

Structure

The study is comprised of a Unit 3 and 4 sequence:

Unit 3: Designing an extended investigation

Unit 4: Presenting an extended investigation

Prerequisites

There isn't a Unit 1&2 Extended Investigation; there is only the Extended Investigation Units 3 & 4 sequence. There are no prerequisite subjects for studying VCE Extended Investigation Unit 3. Students can apply to study Extended Investigation in Year 11 or Year 12.

Course content

Unit 3: Designing an extended investigation

In this unit students develop skills in question construction and design, explore the nature and purpose of research and research methodologies, critically review research literature and identify a specific research question.

Area of Study 1 — students design and justify a research question.

Area of Study 2 — students write a research plan, begin research and present an oral report to an educated non-specialist audience that explains the investigation and justifies the selected research method/s.

Area of Study 3 — students develop and apply the skills of critical thinking.

Unit 4: Presenting an extended investigation

This unit is comprised of two parts that together constitute the student's completion of their investigation. The results of the investigation are presented in a final written report and in an oral presentation to an educated non-specialist audience.

Area of Study 1 — students complete their investigation and write the final report that provides their response to the research question.

Area of Study 2 — students shape their research and findings into a presentation to an educated non-specialist audience and respond to questions and challenges. They reflect critically on the existing research in their field, their own research findings, and research methodology.

Pathways

The skills that students develop in VCE Extended Investigation are essentially transferable to tertiary studies because critical thinking and effective research skills are central to university courses.

Further information: www.ches.vic.edu.au