The Computer Science Undergraduate Scholarship was established in 2000 to identify outstanding students and enable them to have direct placement into advanced classes. It is funded by the School of Computing and Mathematical Sciences at the University of Waikato. The Department of Computer Science runs an annual Scholarship examination. Up to 10 Scholarships are awarded annually based on the examination results and funding available each year. The examination tests knowledge of computing and skill at programming. It is set at a level roughly equivalent to that of the practical programming tasks and final exam of the first-year paper *Introduction to Programming*, with the exception that tasks can be performed in a programming language of the candidate's choice.

1.   **Purpose**

1.1. The Computer Science Undergraduate Scholarship examination serves two purposes. The first is to identify excellent students to whom scholarships can be awarded. The second is to identify students for whom direct placement into advanced classes may be appropriate.

2.   **Eligibility**

2.1. To be eligible, candidates must:

a)   be currently enrolled in either Year 12 or Year 13 at a New Zealand Secondary School;

b)   be intending to enrol full-time (120 points of study) **commencing A Trimester 2022** in one of the following undergraduate degrees at the University of Waikato:

- BCompSc;
- BCMS(Hons) majoring in Computer Science;
- BSc majoring in Computer Science;
- BE(Hons) majoring in Software Engineering;
- BE(Hons) majoring in Electrical and Electronic Engineering; or
- BDes majoring in Interface Design; and

c)   be a New Zealand citizen, permanent resident or an international student.

2.2. To maintain eligibility, students offered the Scholarship must meet the entry requirements for their chosen programme of study (for further information, please check the [School of Computing and Mathematics website)](#).

3.   **Application**

3.1.   The closing date for online applications to request placement in the examination is **15 September each year**

3.2.   As part of the online application process, each candidate must submit:

3.2.1.   An electronic copy of their photo ID (e.g. school ID, Driver's License or other form of official photo ID).

4.   **Value and Tenure**

4.1. The Scholarships will each have a value of **$5,000** and will be paid in two equal cash instalments during the student's first year of enrolment.

4.1.1.   The first instalment will be paid after the withdrawal deadline for A Trimester papers, provided the student is enrolled in a full-time programme of study on that date.

4.1.2. The second instalment will be paid after the withdrawal deadline for B Trimester papers, provided the student continues to be enrolled full-time and has passed all of their A Semester papers.

4.2. The Scholarship will have a maximum tenure of one year.

4.2.1. Candidates may apply to defer the award of the Scholarship for one year. This is usually appropriate for candidates taking the exam in Year 12.

5. Examination

5.1. The Computer Science Undergraduate Scholarship examination will be held on **30 October 2021.**

5.2. The examination is a five-hour practical examination (see appendix 1 for outline of the practical examination). At the discretion of the University, a short follow up interview may be conducted.

5.3. The practical examination will normally be conducted and supervised by the candidate's school, but if necessary may be conducted online with agreement from the School of Computing and Mathematical Sciences.

5.3.1. In each case, candidates will use the school or their own computers for the practical work.

5.3.2. If the candidate undertakes the practical examination online, the candidate will work on their own computer with a Zoom video and audio connection open throughout the entire examination period. The Zoom connection will be set to 'share' a view of the candidate's screen to show the candidate's working. The University may record the Zoom session.

5.4. Candidates must present their proof of identity (e.g. official school student ID card or Driver's license) provided during the application process (see Clause 3.2.1) at the examination.

5.5. For any questions regarding the examination, please contact the Computer Science Department cs-scholarships@waikato.ac.nz.

6. Selection Panel and Selection Criteria

6.1. The Selection Panel will comprise the Division's representative on the Scholarships Committee (in the Chair), the Head of the School of Computing and Mathematical Sciences, and the Chairperson of the Department of Computer Science (or their nominees).

6.2. The Selection Panel's decisions are final and no correspondence will be entered into following the selection meeting.

6.3. The decisions will be based on the examination results of each candidate participating in the Computer Science Undergraduate Scholarship examination, and the amount of funding available each year.

6.4. Candidates who show sufficient proficiency in the subject may merit placement in more senior papers, while those who demonstrate a particular aptitude for the subject will be offered a Computer Science Undergraduate Scholarship.

7. Awarding

7.1. The recipients must meet the Scholarship criteria (see clause 2.1.) by the commencement of A Trimester in the year of tenure.

7.2. The offer of a Scholarship must be accepted by the date indicated or the offer will lapse.

7.3. If a candidate declines a Scholarship, or does not take it up, the Selection Panel may offer it to a reserve candidate.

8. Other Conditions

8.1. The Scholarship may be held with any other scholarship, award or bursary unless the conditions of the other award preclude this.

8.2. In accepting the Scholarship, the recipient will be deemed to have read, understood, and accepted the conditions of the Scholarship and the Scholarships Policy.

8.3. The Scholarships Committee may terminate this Scholarship at any time, and recoup any funds disbursed, if the holder withdraws from the University of Waikato, brings the Scholarship, University or Sponsor into disrepute[1], or is otherwise not complying with the conditions governing the Scholarship and/or the regulations of the University of Waikato. The holder of a Scholarship shall have the right to appeal to the Scholarships Executive against any decision to terminate the Scholarship.

8.4. By accepting the Scholarship, the recipient agrees to participate in any publicity concerning the Scholarship arranged by the University of Waikato.

8.5. International scholars must comply with the conditions of their Immigration New Zealand (INZ) Student Permit.

8.6. The Scholarships Committee has the power to amend or vary these regulations provided that there is no departure from the main purpose of the Scholarship.

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[1] See Code of Student Conduct

APPENDIX 1

Examination Syllabus

Aims and Objectives

The aims of the Scholarship are to enable high school students to:

- Develop an understanding of the nature and principles of computing
- Develop an understanding of methods of analysing problems and practice the application of such methods

Before taking the Scholarship examination, students should be able to:

- Understand, apply and use appropriate terminology, concepts, processes and techniques of computing
- Construct a computer program in a high level language to explore and solve a specific problem

Outline of Examination Syllabus

Students should have a working knowledge of the following areas:

1.   Programming topics

- Control structures
    - Sequence
    - Iteration
    - Choice
    - Nested structures
- Control statements
    - If-then-else
    - While or repeat-until
    - Switch (or case)
- Data types
    - Integer
    - Real (or Float)
    - Character
    - Boolean
- Data structures
    - Arrays (one and two dimensional)
    - Strings (or character arrays)
- Data operations
    - Variable assignment
    - Arithmetic expressions & operator precedence
    - Boolean expressions
- Input/output
    - Input operations: reading from keyboard or text files
    - Output formatting: to screen or writing to text files
    - Printable and non-printable characters

- Programming structures
  - Procedures
  - Functions
  - Value parameters
  - Built-in functions and library routines
- Algorithms and problem solving
  - See [past years sample examinations](#)

2. **Computer Science topics**

- Base conversion
  - Conversion of positive integers between bases binary, octal decimal.
- Binary numbers and arithmetic
  - Addition and multiplication of numbers in unsigned format. Subtraction using two's complement representation.
- Type representation
  - Students should know how characters might be represented using (for example) ASCII and UNICODE.
  - Representation of signed integers and fixed point numbers in two's complement.
  - Floating point numbers using two's complement notation only (8-bit fractional two's complement for mantissa, signed integer for exponent).
  - Awareness of errors associated with accuracy and loss of precision—underflow, truncation, and overflow.
  - Normalization of floating point numbers is not required.
- Languages
  - Compilers and interpreters for high level languages.
- Computer architecture
  - Features of commonly used input, output and backing store devices.
  - Structure of a processor (ALU, CPU—internal details and registers not required).
  - Function of RAM, ROM, cache memory, and disk.
  - The following terms should be understood:
    - Virtual memory
    - Primary and secondary memory
    - Bit (b), byte (B), frequency (hz) and their modifiers (k, M, G, T)
    - Serial and direct access
    - Computer systems
  - Students should understand that an operating system is a collection of programs performing:
    - Communication with peripherals
    - Coordination of processes (including programs)
    - Memory management
    - File handling
    - Accounting
    - Security

- - - Data management
    - Error handling
  - Students should understand the need for systems software to provide:
    - Utilities such as archiving (and compression), de-fragmentation, file maintenance
    - A user interface
- Data representation and graphics
  - The relationship between numbers of colours and numbers of bits should be known; eg, 24 bits allows 224 or (approximately) 16 million colours.
  - The relationship between resolution and file size should be understood
  - Students should appreciate that different resolutions are appropriate for particular devices.
- Applications skills

Programming languages

The Department uses the C# language for first year programming courses. Candidates for the Scholarship are free to use any of the following languages:

- BASIC, including Visual Basic
- C, C++, C#
- Pascal, Delphi
- Java
- Python, JavaScript

For examination questions candidates will only be required to use text-based input and output.

Candidates who wish to program in other languages must seek written approval from the Department of Computer Science before applying for the Scholarship examination.

Resources

The textbook used in the first year Computer Science programming courses is:

- Douglas Bell and Mike Parr: *C# for Students*, Addison/Wesley, 2004

However, any instructional text on programming should be satisfactory.