Regulations

The Computer Science Department at the University of Waikato runs an annual Scholarship examination. Up to 10 Scholarships are awarded on the basis of examination results. 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 Computer Science*, with the exception that tasks can be performed in a programming language of the candidate's choice.

1. Purpose

1.1. The Computer Science 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:

2.1.1. be enrolling or intending to enrol in a BCMS(Hons), BSc, BSc(Tech), BE(Hons) or BDes degree, in one of the computing streams, at the University of Waikato;

2.1.2. meet the entry requirements for their chosen programme of study (for further information, please check the FCMS website or FCMS Handbook);

2.1.3. currently be in Year 12 or Year 13; and

2.1.4. be a New Zealand citizen, permanent resident or international student studying at a New Zealand High School.

3. Value

3.1. The Scholarships will each have a value of $5,000 and will be credited directly towards the tuition fees only of the successful candidates.

4. Examination

4.1. The Computer Science Undergraduate Scholarship examination will be held on **20 and 21 October 2017.**

4.2. The examination is made up of two parts:

4.2.1. a two-hour written examination; and

4.2.2. a six-hour practical examination.

4.3. The examination will be conducted in, and supervised by, the candidate's school. In the case where a school is not able to provide an appropriate environment, candidates will be allowed to sit the examination at the University of Waikato, or

at some other venue to be arranged. Please contact the Computer Science Department as soon as possible to arrange this.

4.4. Candidates will be required to present proof of identity at the examination.

If you have any questions, or require an information pack, please contact the Computer Science Department:

Email: cs-scholarships@waikato.ac.nz

Phone: (07) 838 4021

Website: http://www.cs.waikato.ac.nz/study-with-us/scholarships/computer-science-undergraduate-scholarship

5. Selection Criteria

5.1. The decisions will be based on the examination results of each candidate participating in the Computer Science Undergraduate Scholarship examination.

5.2. 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.

6. Selection Panel

6.1. The Selection Panel will comprise of the Dean of the Faculty of Computing and Mathematical Sciences, the Chairperson of the Computer Science Department and the Faculty's representative on the Scholarships Committee, or their nominees.

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

7. Awarding

7.1. The offer of a Scholarship must be accepted by the date indicated in the offer letter. If a candidate declines a Scholarship, or does not take it up, the Selection Panel may re-offer the Scholarship to another candidate.

7.2. Candidates may apply to defer the award of the Scholarship for one year. This is usually appropriate for candidates taking the exam in their Year 12 at High School.

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

8. Other Conditions

8.1. The Scholarship may be held with any other bursary, scholarship or award, provided that the regulations of the other award do not preclude this.

8.2. If a candidate is awarded more than one tuition fees scholarship, then it is expected that the Computer Science Undergraduate Scholarship will be the first scholarship applied towards the candidate's tuition fees.

8.3.   If a candidate is awarded both a Computer Science Undergraduate Scholarship and either a University of Waikato School Leaver Scholarship or a University of Waikato School Leaver Scholarship with Excellence, then the School Leaver Scholarship can be carried forward to the candidate's second year of enrolment at the University of Waikato, with any remaining balance credited to the candidate's tuition fees in the following year, provided that a passing grade is achieved in all papers in the previous year.

8.4.   The Scholarship will not be refundable to recipients who withdraw from their degree. It will be the responsibility of the recipient to pay the balance of their fees.

8.5.   The Scholarships Committee may terminate a Scholarship at any time, and recoup any funds awarded, if it is satisfied that the recipient is not following the approved programme of study or is not otherwise complying with the regulations governing the Scholarship and/or the University of Waikato. The recipient of a Scholarship shall have the right to appeal to the Education Committee against any decision to terminate the award.

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

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

WHERE THE WORLD IS GOING

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
- Use the basic features of a spreadsheet application
- 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 the attached sample examinations from past years

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
- o 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
  - o The relationship between numbers of colours and numbers of bits should be known; eg, 24 bits allows 2^{24} or (approximately) 16 million colours.
  - o The relationship between resolution and file size should be understood
  - o Students should appreciate that different resolutions are appropriate for particular devices.
- Applications skills

3. **Spreadsheet usage**
   - Cell formats
   - Formulae
   - Simple graph plotting
   - Conditional expressions

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

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.