

University Fair FAQ for Computer Science

Note: Much of this material is taken from the website for prospective CS students, <http://www.cs.uwaterloo.ca/undergrad/prospective/index.shtml>.

Getting Admitted into CS

1. How high do my marks need to be?

Answer: The short answer is that admitted students usually have marks in the low- to mid-80's or higher. The longer answer is that the Mathematics Faculty pays particular attention to the Applicant Information Form (AIF). Recommendations by teachers, extracurricular activities, and participation in Waterloo math competitions can all increase your chances of admission. Admission cut-offs may vary for different programs.

2. Do I need to be really good in Math to get admitted?

Answer: The School of Computer Science is housed within the Faculty of Mathematics, and, therefore, a strong performance in high school mathematics is expected. Students admitted into the Faculty (into CS or other programs) will generally have high school math averages of approximately 80% and above.

3. Do I need CS in high school to get into UW/CS?

Answer: Students applying to CS must have the same courses as students applying to most other Math faculty programs. CS is not a required from high school. CS offers several different courses for incoming students depending on their backgrounds.

4. Can I succeed in UW/CS even if I haven't taken CS in high school?

Answer: Yes. The different entry courses are designed to assist students with varying backgrounds to have a similar base to work from by the end of first year. **Some of our graduates have gone on complete to graduate work in CS without having had any high school background.**

The Different Degrees

5. What is the difference between BCS and BMath? Which is better?

Answer: The School of Computer Science offers two degree programs, both designed for accreditation by the Computer Science Accreditation Council (the BMath/CS, having been existence longer, has received accreditation already). The choice between the BCS and BMath/CS is made after first year. It is possible to switch between plans later, with a careful selection of courses.

- a. The Bachelor of Computer Science (BCS) program is aimed at students who want a solid understanding of computer science, with flexibility to choose from a wide range of elective courses. The Bioinformatics, Business, Digital Hardware, and Software Engineering Options provide concentration in specific areas. You may design your own plan to focus on other areas of interest.
- b. The Bachelor of Mathematics - Computer Science (BMath/CS) program combines Waterloo's strengths in both mathematics and computer science by enhancing the BCS requirements with supporting courses with mathematical content. Two options, Business and Digital Hardware, are offered with this degree.

Neither degree is "better" – both have their strengths, and allow students to tailor their programs to their specific interests.

6. What is the Bachelor of Computing and Financial Management Program?
Answer: The Bachelor of Computing and Financial Management (BCFM) program is offered jointly by the School of Computer Science and the School of Accountancy. The BCFM program gives students a strong core background in both computer science and accounting and financial management. This program will be of interest to students who would like to pursue careers in the applications of computer science in banking, insurance, investment and finance. *(There is additional information about this program in the Math Faculty FAQ).*

Different Programs Involving Computers

7. What is Software Engineering? How is it different from CS?

Answer: Software engineering deals with building and maintaining software systems, with a focus on the activities and issues that arise in developing a software product. Software engineering is one of many disciplines in the field of computing. Both the BCS and BMath(CS) cover introductory software engineering, most notably in CS 246. For students who would like to consider software engineering at greater depth, there are three choices, in order of decreasing flexibility in the rest of your course choices:

- a. Select one or more of the senior level three-course sequence CS 445, CS 446, and CS 447, in which students build a group project from requirements and design through to testing and maintenance as elective choices in your BCS degree.
- b. Complete all three courses in the three-course sequence as well as courses in communication, business, and social issues to obtain a BCS with a Software Engineering Option.
- c. Concentrate on software engineering by enrolling in the Bachelor of Software Engineering (BSE) program. In this highly-focused program, designed to be

accredited by both the Canadian Engineering Accreditation Board and the Computer Science Accreditation Council, students study subsets of the Computer Science and Computing Engineering curricula as well as courses designed specifically for this program (e.g. a project management course and math courses geared towards engineering content). BSE students take all parts of the three-course project sequence.

8. How is Computer Science different from Computer Engineering?
Computational Math? Computational Science?

Answer: These programs are all found outside the School of Computer Science, though students in Computational Mathematics may elect to take a few of our major courses and students in Computational Science take courses in our non-major stream.

- Computer Engineering, offered by the Faculty of Engineering, deals with the design, development, and application of computer systems. It is more focused on problems in digital hardware and at the hardware/software interface, and it has a greater emphasis on adapting standard designs and on using tools to solve problems.
- Computational Mathematics teaches students to employ the increasing power of computers for solving industrial-size mathematical problems arising in a wide variety of fields (though traditionally called "scientific computation", the application base is now much wider). The development and analysis of mathematical models involves such issues as the implications of finite precision arithmetic, and the efficiency, accuracy and stability of numerical computations.
- Computational Science is a program offered by the Faculty of Science to meet the emerging need for computer-literate scientists in the rapidly evolving information technology sector. Students in this program obtain a sufficiently deep understanding of one of the science disciplines to effectively tackle the types of problems that require sophisticated computer modeling.

9. How do Computer Science, Software Engineering and Computer Engineering compare?

Answer: As described above, the three programs do cover some common material, but their focus is different. It is also important to note that both SE and CE are very structured in terms of course selection, and therefore, there is limited opportunity for electives. CS offers much more flexibility in this respect, thereby allowing students a greater opportunity to combine their studies with other areas of interest.

After I arrive ...

10. What CS course should I take when I arrive?

Answer: The correct course will depend on the individual student. The choice will be between:

- CS 125 is a first course in programming using Java. The course is designed for those with little or no prior programming experience. Students who take CS 125 in 1A will take CS 134 in 1B.
- CS 133 is an introduction to object-oriented programming in Java for students who have had previous experience in other languages. No previous experience in Java is assumed. CS 133 uses the same textbook as CS 125, though certain sections will be covered at an accelerated rate, and examples and assignment questions will take advantage of the prior experience of the students. The increased depth of coverage will better prepare students for the successor course, CS 134, and for subsequent Computer Science courses. Students who take CS 133 in 1A will take CS 134 in 1B.
- CS 135 has been designed to provide challenges for students with prior programming experience while remaining accessible and interesting for students who lack such experience. The main prerequisites for CS 135 are intellectual curiosity and willingness to try an innovative approach. The simple but powerful syntax of Scheme allows CS 135 students to focus earlier (and in more depth) on fundamental concepts of computer science and their relationship to mathematics, while laying the foundations for object-oriented techniques. Students who take CS 135 in 1A will take CS 136 in 1B. Currently available only to regular and 8-stream co-op students.
- CS 134 is the successor course for CS 125 and CS 133, though direct entry is possible. The course assumes programming experience in Java and covers elementary data structures and algorithm analysis. Students majoring in Computer Science who take CS 134 as their 1A Computer Science course will take CS 241, taught in Java and C++, as their second required Computer Science course.

11. What other courses should I take in first year?

Answer: All Math faculty students take algebra, calculus, and CS in 1A, and linear algebra, calculus and CS in 1B. The other two courses each term are electives of your choice. Students are encouraged to choose courses they find interesting, and to take a range of courses for their electives to expose themselves to a breadth of topics.

Bioinformatics students have no electives in first year – they take a biology, chemistry and chemistry lab in each term of first year.

12. What languages are taught in first year?

Answer: CS 125, 133, 134, and 136 all use Java, an object-oriented language that was commercially developed and is widely used in industry. CS 136 provides a transition to Java for students who have completed CS 135.

CS 135 is taught in Scheme, a functional programming language (one that relies on the definitions of functions and their application to data, in a style similar to high-school mathematics). Scheme has been used as a teaching language for over twenty years, and is currently in use at many educational institutions, including MIT, Caltech, and the University of California at Berkeley. We are pleased to be the first in Canada to offer this innovative approach (the design, including the textbook and supporting software, has been in use at other universities in North America for several years).

13. When will I learn C++?

Answer: In CS241, which for most students is taken in 2A. Students starting in CS134 take this course in 1B.

14. How much math will I take?

Answer: All CS programs include algebra, linear algebra, two calculus, combinatorics, and two statistics courses. Students pursuing a BMath/CS degree will take at least 5 additional math courses.

15. Can I take the advanced math courses as a BCS student?

Answer: Yes.

16. Can I study other subjects, or will it all be CS and Math?

Answer: Math faculty students are required to take at least 10 courses from outside the faculty. This is to help ensure a well-rounded education. To assist with that goal, CS requires that these electives be from several different areas of study. CS also requires that you study at least one of these areas in a bit more depth.

If you are interested in pursuing a minor in an area outside Math, there is enough room with your course selection to allow that, particularly within the BCS.

The BMath degree allows you to combine your studies in CS with another of Math (C&O, AM, PM, Stats, ActSci).

17. Can I study Business?

Answer: The School offers a Business option with both the BCS and BMath degrees. This option draws on the expertise of various departments at the University of Waterloo as well as the Wilfrid Laurier University School of Business & Economics by extending the solid technical education offered by the School of Computer Science with courses in accounting, business, communications, economics, and management sciences. Many graduates go on to complete an MBA. *(Also mention BCFM)*

18. What other options are available?

Answer: Besides Business and Bioinformatics, the School offers two other options:

- Digital Hardware Option : Students with interests in both computer science and the electrical engineering aspects of computer systems will find that this option provides them a strong background in each of the areas. This specialized academic plan combines the School of Computer Science's expertise in software with the Computer Engineering Department's expertise in hardware. You apply in your first term; acceptance in one of the limited number of spaces is based on academic performance. *(Available with the BCS and BMath/CS, 4-stream co-op only).*
- Software Engineering Option : Software Engineering applies computer science and engineering techniques to the analysis, design, implementation, and maintenance of large software systems. Due to the teamwork needed in projects involving large numbers of people, the option also includes courses in communication, business, and social implications. The core of the academic plan is a three-term team project, involving all stages of the software development life cycle. *(Available with the BCS, regular and co-op).*

19. Do I need my own computer?

Answer: Do you *need* your own computer? No. Might you *want* your own computer? Maybe. UW provides computer labs with all the computing power you need. You may wish to have your own system, however, as a convenience.

If you decide to bring a computer, almost anything you've purchased new within the last 3 years will be good enough. At a minimum, it should have a 650 Mhz processor, 128M RAM, a 20 gigabyte hard disk, a CD-ROM, and a modem or Ethernet card to connect with the outside world. The first thing to upgrade on this basic system would be the memory.

20. Will I have a life outside of school?

Answer: While your studies will take up a large percentage of your time (it is, essentially a full-time job during your undergraduate degree), there will be plenty of time to meet new friends and enjoy living on your own. There are lots of student societies (e.g. MathSoc), clubs (including those focused on academics, hobbies, and cultural groups), athletics (at both the varsity and the recreational levels), and lots of opportunities to meet new people. Be sure to check out your residence and all it has to offer. *(There is additional information about activities available to Math students in the Math FAQ.)*

Money and Jobs *(see the Math FAQ for some additional information)*

21. What kinds of jobs can I get when I graduate?

Answer: The possibilities for what to do with a CS degree are quite varied.

Sample careers of graduates of our CS programs include:

- VP Software, Research in Motion
- Head of Digital Imagery, National Film Board of Canada
- Software Engineer, IBM
- Senior Lecturer, Victoria University of Wellington
- Manager, Animation Research and Development, Pixar Animation Studios
- Research Scientist, Oak Ridge National Laboratory
- Professor, Carnegie Mellon University
- System Design Engineer, Microsoft Corporation.

22. What kind of co-op jobs can I get?

Answer: As with careers after graduation, there are many different co-op positions available for CS students. Recent co-op positions include:

- software tester
- web design
- software designer
- programmer
- help desk support
- university tutor
- research assistant
- financial analyst

Employers have included: TD, Scotiabank, RBC, RIM, Microsoft, UW, Cognos, IBM, iAnywhere, Amazon, Google, Electronic Arts, Pixar, OpenText, MapleSoft, etc.

23. How much do co-op jobs pay?

Answer: The average salaries, by co-op term, are

- Work Term 1, up to \$600
- Work Term 2, up to \$650
- Work Term 3, up to \$708
- Work Term 4, up to \$750
- Work Term 5, up to \$833
- Work Term 6, up to \$874.

24. Will I be able to find a co-op job?

Answer: In recent terms, Math Faculty students have had an employment rate of 90-95% a term. The Co-operative Education department is available to offer assistance to students with the job search process. Students can improve their opportunities for employment by remaining flexible with respect to both the type of job they are looking for and the location of employment.

25. Are all the jobs in Ontario?

Answer: No, the majority of positions available are inside Ontario, but there generally are positions available throughout Canada and internationally.

Bioinformatics

26. What is Bioinformatics?

Answer: Bioinformatics is a new and highly specialized discipline that has emerged from two remarkable phenomena. The first is found in the evidence-gathering, research-intensive world of molecular biology where great amounts of data have been amassing for years. Genome research, for example, has resulted in an exponential growth in the amount of genetic and protein structure data available to biologists. The second is found in the world of computing where increasingly powerful machines, smarter software and tools for analysis, and faster networks for accessing data are being developed. Bioinformatics is the interdisciplinary study that applies the latest ideas of computer science to this wealth of new data to solve important biological problems. The benefits can be applied to the health and medical, agriculture, fisheries, forestry, and environment sectors of society.

Bioinformatics is offered jointly by both the Faculties of Mathematics and Science, combining the strengths of biology and computer science. The Math faculty offers courses in computer science, mathematics, and statistics. Courses through the Faculty of Science in biology, biochemistry and chemistry will increase students' knowledge of organisms, plants and mammals, while they develop research skills and laboratory techniques. Through a series of new

courses that combine computer science and biology, students are introduced to this emerging area of study and are exposed to issues and trends in bioinformatics.

After their second year of studies, students can choose to focus on either the computer science aspect (leading to a BCS) or the biological aspect (leading to a Bachelor of Science).

The degree is currently available only as a 4-stream co-op program.

27. Does Bioinformatics have the same entrance requirements as CS?

Answer: The basic high school course requirements for Computer Science also apply for Bioinformatics. However, in addition, students also need Chemistry and one of Biology and Physics. Grade 11 Computer and Information Science is again recommended, but not required.

28. What kind of marks do I need?

Answer: Currently, admission standards are the same as for entrance into Computer Science.

29. How big is the incoming class?

Answer: In recent years, the incoming classes of Bioinformatics students have included approximately 15-25 students.

30. What can you do with a Bioinformatics degree when you graduate?

Answer: The following are sample careers of Bioinformatics graduates:

- Bioinformatics software and database expert in a medical lab
- Software engineer for a genome project
- Bioinformatics scientist in a government-operated research and development department
- Project manager for a pharmaceutical company.

Note that students who earn a BCS/Bioinformatics degree may also follow a more "traditional" CS career, which, of course can be quite varied. Many students in this field continue on to graduate studies in CS, Bioinformatics or Biology.

At present, demand exceeds the supply of Bioinformatics professionals.

31. What are Bioinformatics co-op jobs like?

Answer: Many Bioinformatics students work in positions similar to other CS students (particularly in their first few work terms). However, many obtain work term positions as research and lab assistants.