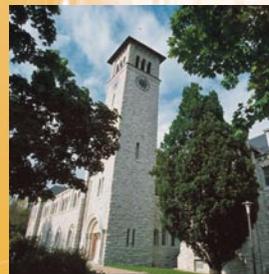




Queen's  
UNIVERSITY

# Mathematics and Engineering

Applied Mechanics  
Computing and Communications  
Systems and Robotics





# Mathematics and Engineering

Modern communications, control, electrical, mechanical, and mechatronic systems require sophisticated mathematical models and analysis. This unique engineering program meets this challenge – its versatile graduates have the solidity of an engineering degree, plus the flexibility afforded by their having the exceptional analytical skills demanded by the strong mathematics component of the program. Mathematics and Engineering graduates who choose to continue their education by pursuing graduate studies have a very good track record of being admitted for their studies into the best schools in the world. Graduates of the program are eligible for registration as professional engineers, the program having been fully accredited by the Canadian Engineering Accreditation Board since 1967.

## PROGRAM OPTIONS

1. Applied Mechanics
2. Computing and Communications
3. Systems and Robotics

All options include a final year engineering project course, for which the students take advantage of the Department's research and computing facilities.

## CAREER PREPARATION

The graduates of this program have been successful in finding a variety of challenging engineering jobs in fields such as aerospace systems, biomedical engineering, engineering consulting, manufacturing processes, robotics, software engineering, and telecommunications systems. As well as finding work in engineering fields, Mathematics and Engineering graduates have also successfully pursued other careers, such as medicine, finance, and management consulting. In their jobs, graduates find that their strong mathematical foundation makes them versatile, adaptable, and confident in tackling new challenges.

After completing the program, a number of graduates have elected to pursue graduate studies in engineering fields or sometimes in other fields. As is the case with career options, the foundation in mathematics makes it possible, even easy, for students to change disciplines upon graduation.

Integrated Learning Centre



# Why Applied Mechanics?

The Applied Mechanics option in Mathematics and Engineering blends elements of traditional Mechanical Engineering with the strong mathematics background that all students in the program receive. Students take engineering courses in subjects like mechanics, fluid mechanics, and thermodynamics, and specialized courses, only for Mathematics and Engineering students, in engineering systems, control theory, and mechanics. These specialized courses are taught at a very high level, and serve to distinguish the Mathematics and Engineering graduates from their traditional counterparts. Graduates are well prepared for careers in traditional Mechanical Engineering fields, and also have available the flexibility afforded by the unusually strong mathematics component of the program.



*"Apple Math has made learning everything else so much easier for me. It's hard not to know what you're doing when you understand everything on such a fundamental level. No other Engineering program at Queen's could have given me this kind of training and preparation."*

**Tobias Barton, Sci '10**  
Mechanical Designer, J.L. Richards & Associates Ltd



*"The Apple Math program at Queen's is a truly unique program because of the breadth of knowledge that it gives you. Students learn fundamental mathematical tools that they can apply to many different fields. This allows alumni to work and study successfully in almost any area they choose."*

*I am currently working as a data scientist at Capital One, and my undergraduate experience in Apple Math has proven to be a great asset. My mathematical knowledge gained from this program allows me to understand the principles underlying the strategy of many different areas of the business. An important part of professional development is the ability to learn new material in a high paced environment, and the Apple Math program gives students plenty of practice with this."*

*Overall, I'd say that Apple Math graduates are well placed for success in a broad range of professions and research areas."*

**Ali Wytmsa, Sci '12**  
Data Scientist, Capital One

# Why Computing and Communications?

There is increasing demand for graduates with expertise both in communications engineering and certain areas of software engineering. With the emergence of and proliferation of communications networks and pervasive computing has come the demand for mathematically sophisticated data processing algorithms, as well as cryptographically secure protocols, as attested to by spectacular miscues that have made headlines. The Computing and Communications option combines basic communication and signal processing systems content with a package of courses in protocols, algorithm analysis, and software engineering methods. Apart from their engineering courses and the background in mathematics, students take high level, program specific courses in engineering systems, communication and information theory, stochastic processes and systems, cryptography, and coding theory. Graduates of the program are prepared for careers in areas of telecommunications and software engineering, as well as have the ability to pursue the wide variety of career options available to Mathematics and Engineering graduates.



*"Through all of the high level math courses and projects, Apple Math has made me who I am today by forcing me to learn how to do complicated things extremely quickly, which is one of the most important skills in today's fast-paced work environment. Being able to adapt and learn new and exciting ideas is infinitely more important than excellence at previous year's work. Another crucial skill needed in today's work environment is the ability to manage your time efficiently. Apple Math has taught me to prioritize properly and make the best use of the time available to me. Acquiring skills such as these, on top of the math and engineering coursework you learn, as well as the recognition of the program, made Apple Math the perfect choice for me."*

**Andrew Cerisano, Sci '11**  
Software Development Engineer in Test, Microsoft



*"After graduating, I completed a Masters in Numerical Analysis at the University of Oxford. During my Masters I discovered that I had a competitive skill set even compared with my academically strong peers. Math & Engineering helped me develop a balance of skills in mathematics and in the ability to turn theory into practice as working software. Additionally, the program helped me develop the skills to understand problems across disciplines and read literature in multiple fields, and this is an invaluable skill in the applied sciences. I now work as a software consultant in finance and trading, and I know my employer places a high value on mathematical ability in their hiring process."*

**James Wood, Sci '08**  
Client Services Developer, ION Trading

# Why Systems and Robotics?

The interface between engineering systems and robotics is an area that demands sophisticated mathematics. Moreover, the recently christened mechatronics area is characterized by the use of sophisticated control methods with electronic/digital implementations, active structural materials, and other topics from classical mechanical design. The Systems and Robotics option blends mathematics, electrical engineering, and mechanics into one cohesive program. In addition to the common core of mathematics courses, students in Systems and Robotics take courses in electronics, microprocessing systems, and electric machines from the Electrical and Computer Engineering Department, dynamics and mechanics from Physics, and advanced systems engineering and control courses offered by the Mathematics and Statistics Department.



*"The Apple Math program provides a unique engineering education combining traditional engineering topics with the underlying applied mathematics, providing graduates with a technical advantage when entering the engineering work force or pursuing further education such as an MEng. The comprehensive education that I received from the Apple Math program at Queen's has prepared me for success in an exciting career at NovAtel Inc., a world leader in global satellite positioning products and technologies. The Apple Math program has prepared me for challenging real world problem solving, and the Apple group projects and presentations have allowed me to build the confidence needed when leading engineering teams and presenting solutions to major international organizations such as the US Federal Aviation Administration and the European Space Agency."*

**Allan MacAulay, Sci '08**  
**Applications Engineer, Aerospace & Defense, NovAtel Inc.**



*"I recently graduated with an M.Sc. in Analytics from North Carolina State University, and am now working for a boutique marketing analytics consultancy as a data scientist. Analytics is a field which requires not only technical proficiency and a fundamental understanding of statistics, but the ability to leverage results to create practical insight and inspire business decisions. Apple Math was a perfect fit for me, and integral in preparing me for this field of study."*

*Apple math teaches you how to learn; how to drill down into abstract concepts and use them in application. In addition to developing my mathematical and abstract reasoning skills, it provided me with technical skills and the mathematical foundation required in graduate school and my career. The smaller class sizes are also fantastic - you get a ton of support from professors and build everlasting friendships. Consider Apple Math if you are looking for a challenging and very rewarding undergraduate experience."*

**Alex Pierratos, Sci '13**  
**Data Scientist, Elicit LLC.**



# External Praise for Mathematics and Engineering

*"I recently saw two of the 4th year engineering projects that came out of the "Queen's Mathematics and Engineering" program. I am very impressed with the mathematical sophistication of the work. I think the level is a year or two beyond the level of typical good students from US electrical engineering programs and on a par with the level of good students from outstanding Indian and Chinese institutions which, like the "Queen's Mathematics and Engineering" program, really focus on developing the mathematical sophistication of the students. I am confident that there are many areas of graduate study which will find this level of preparation very attractive."*

**Peter Doerschuck**  
Professor, Department of Biomedical Engineering, Cornell University

*"The engineering projects that I have read from fourth-year students in the Queen's Mathematics and Engineering program show a level of sophistication that is rare at the undergraduate level. These students will be exceptionally well-prepared for graduate research in a variety of disciplines within engineering and applied mathematics.*

*I hope this program's top students will consider Harvard when applying to graduate school!"*

**Todd Zickler**  
Associate Professor, School of Engineering and Applied Sciences,  
Harvard University



DEPARTMENT OF  
**Mathematics  
and Statistics**

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