

Computer Science & Software Engineering



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Welcome



*Professor Tanja Mitrovic
Head of Department*

It is a great time to start towards a career in Computer Science and Software Engineering, as the demand for graduates is increasing and there are many new types of challenging jobs. Computers are not only being used in business and engineering, but in every facet of modern life, and they are also being applied to completely novel problems.

Our graduates work all around the world, in various areas ranging from business, financial and legal, to education, entertainment and health areas. Take a look at the profiles of some of our graduates – it is always a pleasure to hear about their achievements.

The department strives to provide the best care of students by lecturers who are excellent in research and passionate about teaching. Five of our staff have received awards for excellence in teaching.

The department has a strong international research reputation in many areas, which are represented in both undergraduate and postgraduate courses. The research areas include networking, computer graphics, computer vision, software engineering, artificial intelligence, simulation, security, human-computer interaction, computer music and computer-based education. We'd love to have you here and hope you will be excited and challenged by the courses you will take. Whether you are just beginning your studies in 2011, or are a returning student, we wish you every success in your studies.

This handbook is intended to help you plan your course of study whether you are intending to specialise in Computer Science or whether you are looking for courses which best complement other disciplines. Please consult the University Calendar and the Enrolment Handbook for authoritative details about courses and programmes.

For the latest information, together with further details about us and our teaching and research programmes, please go to www.cosc.canterbury.ac.nz.

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What is Computer Science?

When people think of Computer Science they often simply think of programming, but this is actually only a very small part of the subject, and many graduates will do very little of it. Computer Science is more about helping people to use computers for doing their work efficiently and effectively, and solving problems for people by analysing their needs and constructing solutions to those needs. Forget the 'nerd' image of computer scientists. Employers want people who have good oral and written communication skills as well as technical ability.

Computer Science covers a rich range of topics such as artificial intelligence, software engineering, computer graphics, algorithm design, databases, interface design, data communications, and computer security.

Computer skills are also invaluable to students in other disciplines. The department is now a member of the College of Engineering, and so has strong links with Engineering, in particular Electrical Engineering. We are also closely linked with many Commerce courses. Students in other sciences, particularly the physical sciences and Mathematics/Statistics, would also find a background in computing invaluable. Social scientists, linguists, and psychologists all make extensive use of computer technology. Additionally areas like mathematical biology are at the interfaces of biology, mathematics and computing.

The department offers a course, COSC 110 Working in a Digital World, designed for people who do not need to program, but want to make more effective use of technology. This could be useful to almost every student at the University. Software Engineering, the part of the subject dealing with tools and techniques for developing large software systems, has become so important that it is now recognised in the department's name.

So whatever your interests, there is almost certainly a niche for you.



The Erskine building situated on the corner of the Science and Engineering road.

What background does a Computer Science student need?

There are no specific requirements for entry into 100-level Computer Science courses, although a background in Mathematics and an interest in problem solving are important. The initial courses in Computer Science do not assume any previous experience, but some familiarity with computers is an advantage.

Computer Science at UC

The Department of Computer Science and Software Engineering (CSSE) at UC has a strong international reputation. It teaches courses that are reviewed regularly against international standards and its graduates are in strong demand.

The lecturing staff are also active researchers and have one of the best records of research publications in the Pacific region.

The department is housed in a custom-designed building with well-equipped computing laboratories

Career opportunities

There is a shortage of graduates who are qualified in Computer Science and Software Engineering; particularly those who combine technical expertise with good communication skills and teamwork ability. Graduates with degrees that include disciplines such as commerce and engineering are also very employable.

Employers look for a variety of skills. For example, with the rapid growth of web-based technologies, graduates with skills in web design and related tools are highly sought after. Our degree programmes do not focus exclusively on any particular vendors' architectures or products. Graduates who have a good foundation in computer systems, as well as skills in widely used object-oriented programming languages, databases and networks, are likely to find employment very easily. Computer Science has become a professional qualification and employers frequently select graduates with a four-year degree (most other professional degrees also take four years).

Christchurch is home to several large international software and electronics companies, whose work is at the cutting edge of development. There are also many employment opportunities with organisations that run large computer-based systems, such as finance companies, airlines, government departments, state-owned enterprises, consulting companies, and computer organisations themselves.

Work within these organisations often offers opportunities for overseas travel. Graduates with a four-year degree usually have no problem in gaining positions internationally, although it is often beneficial to work in New Zealand to gain some initial experience. Many niche employment opportunities also exist in organisations such as small companies, schools, and city councils. The New Zealand ICT Innovation Institute is located on campus and provides opportunities for interaction with local industry.



Graham Dockrill

*Bachelor of Science in Computer Science
Company Director and owner, Hairy Lemon
Web Solutions Limited*

To own New Zealand's largest web development company is Graham's goal. As Director and owner of Hairy Lemon Web Solutions, Graham is managing one of New Zealand's fastest growing web development companies.

Majoring in Computer Science at UC, Graham has a strong knowledge of computers, as well as extensive management experience. Formerly a branch manager for Steel and Tube Ltd, one of New Zealand's largest steel merchandising companies, he heads the marketing side of Hairy Lemon.

There are also substantial opportunities available to anyone who is both well qualified in a field for which computing is important, and is skilled in computer use. Few jobs now do not involve working with computers, so even a small computing component in a degree is likely to be useful.

The following link offers access to UC Careers and Employment advice: www.canterbury.ac.nz/careers/



Janina Voigt

Studying towards a PhD in Oxford, England

Never having considered Computer Science as a study option, Janina only stumbled across it when her boyfriend decided to teach her some programming. She enjoyed it so much that she started to learn Java from a library book and continued on to enrol in Computer Science at UC.

'I really enjoy the challenge of studying Computer Science. There is so much to learn and so much I don't know. The classes are really interesting and it's easy to see where my study is going to take me,' she explains.

'Computer Science is really practical and allows you to use your imagination and creativity. We usually have two hours of practical classes (labs) per week in each subject. This means we don't just learn about computers but get to try out what we learn and see results right away. The software engineering courses are particularly practical. Students do a group project and make software for a real client. I feel like I'm learning skills that will be really useful once I go out into the industry.'

Getting advice

Up-to-date information on the department and courses is available from our web site www.cosc.canterbury.ac.nz, and this is a good place to start.

For general advice on the requirements of your degree, you should contact the student advisor in the college office, depending on which degree you are interested in.

Science: tracey.robinson@canterbury.ac.nz
Commerce: bsec@canterbury.ac.nz
Engineering: engdegreeadvice@canterbury.ac.nz

For more specific advice about course content relating to Computer Science and Software Engineering, you should approach the department. The staff are happy to give advice on matters relating to university study. Feel free to contact us by checking contact details at the back of this book, or drop in to see us at the department on Level 2 of the Erskine building.

For advice on a specific course, try to contact the person identified under 'Contact' in the course list in this brochure. If they are unavailable, administration staff will direct you to one of the other lecturers, who will be happy to help you.

Facilities

The Department of Computer Science and Software Engineering moved into the award winning Erskine building in 1998. Purpose-built labs are equipped with a wide range of current hardware; running Linux, Windows and MacOS operating systems. There are over three hundred networked desktop machines in the department and several powerful server computers. Most courses have a two hour laboratory each week. The undergraduate labs are also open for students to use whenever no tutorials or labs are being held in them, and are open for extended hours in the evenings and at weekends.

Graduate students are all assigned a place and workstation in one of our research areas. They also have access to specialised equipment.

There is an extensive range of equipment available to assist students who may have difficulty using standard computing environments. If you are enrolling in Computer Science courses and think you could benefit from special equipment, please contact the Disability Resource Service well before the start of your study, so that you can discuss your needs and receive the best setup for you.

First degrees in Computer Science

For information on degree structures please see the Enrolment Handbook or go to www.canterbury.ac.nz/courses

Students specializing in Computer Science work towards degrees in either Science (BSc or BSc with Honours) or, for those with interests in business aspects of computing, Commerce (BCom or BCom with Honours). The BCom may be taken with endorsements in Software Development or Computer Systems and Networks, where students have taken the required courses. If you are primarily interested in computer hardware, you should consider taking some of our courses as options in a Computer Engineering or an Electrical Engineering degree (BE(Hons)). Information about this degree is available from the College of Engineering. A bachelor's degree generally takes a minimum of three years study, while an Engineering degree takes four years.

For those with a strong academic background, an honours degree is a possibility. This normally involves a total of four years full-time study, but in some cases students will be considered for direct entry into second year Computer Science courses with a view to completing an honours degree in three years. Such students will have gained high marks in NCEA/scholarship examinations and completion of the STAR course will be beneficial.

During the summer holidays some assistance with preparation is available for students with insufficient computing background, who would otherwise be eligible for direct entry. For details go to www.cosc.canterbury.ac.nz/open/teaching/classes/summerprogramme/

Planning your course

To help you plan your programme of study, a template is included at the back of this book, together with a diagram showing the current courses and their relationships.

In their first year Computer Science and Computer Engineering majors should take COSC 121 and COSC 122, as these courses are necessary for entry into all 200-level COSC courses. COSC 110 is also recommended, as is ACIS 125 (Introduction to Programming with Databases), which is taught jointly with CSSE. For entry to 200-level COSC you also require 15 points of MATH/STAT courses). However, you are strongly advised to enrol in at least 30 points. See the notes on MATH prerequisites for more details.

Students taking an Engineering Intermediate programme should contact the College of Engineering for advice on course planning.

In choosing additional papers for your first year you should consider carefully which subjects you would wish to study at 300-level. You will need to take at least 60 points at 300-level to graduate in Computer Science, but the other 30 points of a typical third year programme could be from any other subjects in the Science schedule, if you are doing a BSc, or the Commerce schedule for students studying for a BCom. This means that it is important to choose first year papers that will allow you to have completed the prerequisites for the 300-level papers before your third year. It is also a good idea to choose papers which will leave as many options open to you as possible. Students often develop an interest in areas which may be different from those they had considered before coming to university.

A typical student would enrol in 120 points in their first year. Students with a strong academic background who wish to be considered for the Honours program should ensure that they take up to 150 points in the first year.

If you have a strong interest in programming in your second year it is recommended to take ENCE260 or COSC 263. If you do not yet have 30 points of MATH/STAT you will need to enrol in additional papers to ensure that you will have this prerequisite for entry to 300-level COSC. Additional MATH/STAT courses are also recommended for all students.

Which other COSC papers you do will be determined by your own interests, but should fulfil the requirements for a minimum of 60 points, or 90 for honours of 300-level Computer Science. Use the Computer Sciences Courses chart at the back of this handbook to help you with this. Honours students need a further 30 points of 300-level Computer Science, but other students can choose 300-level papers from the appropriate schedule in Science for a BSc.. Make sure that you can also satisfy the requirement for 225 points above 100-level.

Students who wish to proceed to postgraduate study should be careful to choose 300-level papers which will give them the required preparation for the 400-level papers they are interested in.

The Computer Science and Software Engineering staff are happy to advise and help you with planning your courses.

Mathematics and Statistics requirements

You will be required to pass at least in 15 points of MATH/STAT in order to be admitted to 200-level Computer Science papers. Enrolment in 300 level courses will require at least 30 points of MATH/STAT.

Students are strongly recommended to enrol in at least 30 points from 2010 of MATH/ STAT in their first year preferably MATH 120 and STAT 101. 200-level students should make sure they enrol in sufficient MATH/STAT to have passed 30 points before they wish to enrol in 300-level COSC. Students who do not have a strong mathematical background should consider enrolling in extra papers to ensure that they gain the required prerequisite.

Students need a solid background in Mathematics to do well in advanced Computer Science courses. There are two main reasons that Mathematics is important. Firstly, Computer Science and Mathematics are strongly linked. Many areas of Computer Science requires the same kind of thinking as Mathematics, such as manipulating symbols, constructing proofs, and thinking logically. Secondly, there are specific techniques from Mathematics that are needed in certain Computer Science courses. For example, logarithms are used frequently in algorithm analysis, linear algebra is important in computer graphics, and statistics are important in information theory, data communications and performance evaluation of the Internet and computer-based systems.

For these reasons it is very important that Computer Science students make good use of the Mathematics courses available and do not try to minimise the amount of effort they put into Mathematics. We encourage students to do more than the minimum requirements; those who minimise their Mathematics preparation often struggle in their Computer Science courses. MATH 120 contains many topics that are important in Computer Science, and is the most relevant of the Mathematics courses. We strongly advise Computer Science students to take MATH 120 in their first year, unless this causes a clash with obtaining prerequisites for other courses, such as Engineering.

Please note that students gaining direct entry into 200-level MATH courses can satisfy this graduating requirement by passing MATH 231 'Discrete Methods'.

STAT 101 is also strongly recommended and other first year Mathematics courses may also be relevant; especially MATH 102/103/120/130 or 170. MATH 101 is not acceptable as a Mathematics prerequisite. Some Mathematics courses are available in the summer break. See MATH for further information on available courses.

For students who intend to specialise in Computer Security and Forensics at postgraduate level, enrolment in MATH 221 is recommended. This paper also forms part of the 30 points of the Mathematics or Statistics prerequisites.

Summer School courses

A non-credit course with no assessment, Advanced Computing, is for students who expect to do very well in NCEA and who are considering direct entry to 200-level courses, or mature students with considerable programming experience, or those considering a GradDipSci. This course is a self-study module with support from an experienced tutor.

For students in their second or third year, COSC 366 (Research Project) is the only credit course offered in the summer semester.

COSC 486 is also a summer school research project which can be undertaken by students in their fourth year.

These courses only run if there are sufficient enrolments. Other courses are offered from time to time. Information can be obtained from the Science Headstart web pages, www.summer.canterbury.ac.nz, or from the department.

Scholarships and prizes

A number of scholarships and awards are available, some specifically for Computer Science and Software Engineering students. Some general scholarships are available to all students. Details of scholarships can be obtained from the Scholarships Office, or go to www.canterbury.ac.nz/scholarships/

The Scholarships Office publishes a monthly Scholarship Announcement flyer that is widely distributed around the University. This information also appears in the University's 'Diary Plus' and is archived in the 'Breakout' database at www.fis.org.nz/index.php?app=BreakOut.

Of particular interest to Computer Science Students are:

- The G. B. Battersby-Trimble Scholarship, for 400-level Computer Science students and above.
- The HP Award for Excellence in Software Engineering.
- The Peace Scholarships, for Computer Science students in their final year for information go to www.peace.co.nz

Mentoring programmes

Trained mentors are available to help students adjust to university life. Mentors are experienced students studying a variety of courses. Your mentor will work with you to help you find your way around the campus, give you lots of survival tips, answer questions about the University and its systems, advise you where to go or who to see, introduce you to other students, and make the place seem less isolating. Your mentor is a friendly face, someone to share worries and concerns with and to provide you with encouragement and support.

For further information go to www.canterbury.ac.nz/sas/mentoring (follow the link to register for a mentor) or email mentoring@canterbury.ac.nz

Honours and Postgraduate Programmes



Honours degrees (Fourth year)

The Department of Computer Science and Software Engineering offers a programme of courses leading to an honours degree in Science or Commerce – BSc(Hons) and BCom(Hons).

Admission to the BSc honours programme is normally at the end of the first year of study or subsequently on the basis of suitable grades.

Admission to the BCom honours programme is at the end of the third year of study. See the UC Calendar or Enrolment Handbook for further details, or consult the student advisor in the Faculty of Science or CSSE staff. Candidates will normally have completed 90 points of 300-level COSC courses.

At the 400-level, BSc(Hons) and BCom(Hons) students must take COSC 460 (Research Project) and eight half-year courses selected from COSC 401-475. The availability of courses will change from year to year, according to the research interests of staff members. For more information on Honours courses, refer to the department's Postgraduate Prospectus online at www.cosc.canterbury.ac.nz/open/students/postgrad.shtml

The Department of Computer Science will accept appropriately qualified candidates for studies leading to the degrees of Postgraduate Diploma in Science (PGDipSc), Postgraduate Diploma in Science: Computer Security and Forensics, Master of Science, Master of Commerce and Doctor of Philosophy. A PGDipSc course consists of one year of advanced Computer Science papers, whereas the requirements for the other degrees include a thesis embodying the results of individual research or development

work. A PGDipSc candidate may subsequently be admitted to the MSc course, or an MSc candidate may decide to revert to a PGDipSc after the first year of advanced papers.

Master of Science (MSc) or Master of Commerce (MCom)

For holders of a three-year bachelor's degree, the Master of Science and Master of Commerce consist of one year of advanced Computer Science and Software Engineering courses plus thesis, while students who have met the required standard in BSc(Hons) need only produce a thesis. The year of papers consists of eight one-semester courses selected from the same list offered to final year honours students.

Students wishing to graduate with a Master of Commerce degree will need to take an approved set of courses from Computer Science and Software Engineering, Accountancy, Business Administration, Economics, or Management Science in the first year, followed by a thesis with a computing-oriented topic in the second year.

To be admitted to a Master of Science or Master of Commerce degree, a student must normally have gained a bachelors degree of reasonable standard in Computer Science.

Doctor of Philosophy (PhD)

A full-time PhD degree requires a minimum period of enrolment of two years and must be completed within four years, unless there are special circumstances. The time is spent doing research which leads to the presentation of a thesis embodying the results of individual research and development work. There is usually no coursework required, although this is very much dependent on the student and topic. Part-time enrolment is possible for students with outside commitments.

To be admitted to the PhD programme students must have an Honours or Master's degree of a high standard, with substantial Computer Science and Software Engineering content.

Postgraduate Diploma in Science (PGDipSc)

A PGDipSc is for students who already have a Computer Science degree, but who want to upgrade their professional skills and employability. It consists of eight advanced Computer Science and Software Engineering courses, normally taken in one year, without the requirement of a thesis.

Postgraduate Diploma in Science: Computer Security and Forensics

Most postgraduate courses are based upon a broad range of papers, although the department recognises the desire for some students to specialise.

The Computer Security and Forensics Postgraduate Diploma is for candidates wishing to gain employment in security and forensics related areas, such as with public and private security agencies, computer companies, local police forces and other government agencies. This course provides both theory and practice and will enable students to develop the skills to manage a forensic case and understand and perform detailed technical analyses of computer-based evidence. It will further provide extensive understanding of security-based architectures as well as develop skills in the use of tools to test and evaluate such systems.

Details of the courses for this programme and full information on its availability can be obtained from the CSSE department website: www.cosc.canterbury.ac.nz/open/students/intending/pgforensics.html

A separate brochure entitled Computer Security and Forensics, is available and provides much more detail on course material as well as career opportunities

Graduate Diploma in Science (GradDipSc)

The GradDipSc is aimed at students who already have a bachelor's degree (or equivalent) in any subject, but now wish to study Computer Science and Software Engineering. It is also suitable for students who are considering a master's programme, but need to strengthen their Computer Science and Software Engineering knowledge before doing so.

The programme is equivalent to a full-time load for one year, but is most often taken part-time over two years or more, depending on the student's knowledge and background.

For an up-to-date list of postgraduate courses offered by the Department of Computer Science and Software Engineering please refer to www.cosc.canterbury.ac.nz

Research

The Department of Computer Science and Software Engineering is a truly multi-disciplinary department, enabling both academic staff and students to push the limits of the state-of-the-art.

While researching a multitude of computer-related topics, academics and students work in close collaboration with the Departments of Management, Electrical and Computer Engineering, and Accounting, Finance and Information Systems. There are also close ties and research opportunities with the Human Interface Technology Laboratory (HITLab NZ) and other highly regarded research centres.

Research groups within the Department include:

- Algorithm Engineering
- Firewalls and Internet Security
- Human Computer Interaction and Multimedia
- Intelligent Computer Tutoring
- Networks: Protocols, Distributed
- Processing and Simulation
- Programming Languages
- Computer Graphics and Image Processing
- Software Engineering and Visualisation
- Computer Vision
- Distributed Systems

For more details about these research groups, go to www.cosc.canterbury.ac.nz/research/#groups

The NZ ICT Innovation Institute (www.nzi3.canterbury.ac.nz) provides a framework for research partnerships with local companies.



Student Marcus Schoo (left) and Dr Richard Green with 'Britney', a robot chimp to evaluate users' reactions to mimicking their mannerisms

How to Apply

For more detailed information on enrolment and course fees, go to www.canterbury.ac.nz/enrol

International PhD students

All new international PhD students pay the same fees as New Zealand domestic students. For further information, go to www.canterbury.ac.nz/intstud/costs/

Courses

For the most current information on individual courses go to: www.cosc.canterbury.ac.nz/open/teaching

100-level courses

COSC 110 Working in a Digital World

15 points

COSC110-12S1 (C)

An introduction to computers, how they work, and what they can and cannot do. Software packages for word processing, spreadsheets, and databases are taught. This is a non-advancing course.

Contact: Associate Professor Ray Hunt

COSC 121 Introduction to Computer Programming

15 points

COSC121-12S1 (C) COSC121-12S2 (C)

Computer programming in a high-level language, with special emphasis on style and structure. This course is normally required as preparation for Cosc122 and as a prerequisite for all 200 level CSSE courses.

Contacts: Professor Andy Cockburn (S1) and Supervisor to be confirmed (S2)

COSC 122 Introduction to Computer Science

15 points

COSC122-12S2 (C)

An introduction to computer science, including algorithms, computability, complexity and object-oriented programming metaphors. Both COSC 121 and COSC 122 are normally required as prerequisites for 200-level

Contact: Professor Tim Bell

INFO125 Introduction to Programming with Databases

15 points

INFO125-12S1 (C)

Analysis of business environments to define user requirements, introduction to programming and database concepts, development of simple applications using VB.net and Microsoft Visual Studio. INFO125 is recommended for students intending to advance in Computer Science as well as for those intending to specialise in e-Commerce and Information Systems.

Contacts: Nelly Todorova, Department of Accounting & Information Systems email: nelly.todorova@canterbury.ac.nz and Amali Weerasinghe.

200-level courses

COSC 261 Foundations of Computer Science

15 points

COSC261-12S1 (C)

This course deals with fundamental concepts and techniques in Computer Science. The first part includes probabilistic methods of Computer Science. The second part deals with automata theory. The third part consists of graph theory and compilers

Contact: Professor Tim Bell

COSC 262 Algorithms

15 points

COSC262-12S1 (C)

This course teaches a range of fundamental algorithms and analyses their complexity.

Contact: Associate Professor R. Mukundan

COSC263 Introduction to Software Engineering

15 points

COSC263-12S1 (C)

An introduction to the tools and techniques of software engineering. Topics covered include object-oriented programming and design, test-driven development and software project management

Contact: Dr Wal Irwin



The interior of the Erskine building.

COSC 264 Data Communications & Networking

15 points

COSC264-12S2 (C)

This course covers principles of theory and practice of data communications and networking, including information-theoretic fundamentals of communication

Contact: Dr Andreas Willig

COSC 265 Relational database systems

15 points

COSC265-12S2 (C)

An introduction to database systems, database design, relational databases and database management systems..

Contact: Professor Tanja Mitrovic

ENCE260 Computer Systems

15 points

ENCE260-12S2 (C)

An introduction to Computer programming in C, computer architecture and embedded systems.

Contact: Electrical & Computer Engineering Dept

300-level courses

COSC 362 Data and Network Security 15 points

COSC362-12S2 (C)

The course provides a study of the principles and practice of security for both stored and transmitted information. It addresses the fundamental principles of computer and network security and covers: Internet Threats and Hacker Techniques, Firewall Security, Intrusion Detection Systems, Authentication, Encryption Technologies, Public Key Management, Virtual Private Networks and Wireless Network Security

Contacts: Dr. Dongseong Kim

COSC 363 Computer Graphics

15 points

COSC363-121 (C)

The course focuses on all aspects of fundamental computer graphics, including 2D/3D object representations, transformations, modelling and rendering algorithms. The course also aims to provide a good foundation for OpenGL programming, which is a widely accepted standard for developing graphics applications

Contacts: Associate Professor R. Mukundan

COSC 364 Internet Technology and Engineering

15 points

COSC364-12S1 (C)

The course studies important internet technologies and protocols, including: IPv6, IP routing, IP Multicasting, and Quality-of-Service frameworks. Furthermore, the course introduces students to the theoretical underpinnings (Markov chain and queueing models) and practical work in network performance modelling and traffic engineering.

Contacts: Professor Krys Pawlikowski

COSC 366 Research Project

COSC366-12S2 (C)

Students will gain experience in performing research in the fields of Computer Science and Software Engineering

Contacts: Professor Tad Takaoka

COSC 367 Computational Intelligence

15 points

COSC367-12S2 (C)

This course introduces Computational Intelligence computing concepts and demonstrates how they are used to solve problems that are normally difficult or intractable by conventional means. Topics covered include artificial intelligence programming languages, logic representations, biologically inspired algorithms and computer vision. Practical work will focus on solving sample problems using these various techniques.

Contact: Professor Tad Takaoka

COSC 368 Humans and Computers

15 points

COSC368-12S1 (C)

The course provides an introduction to Human-Computer Interaction (HCI). HCI is concerned with understanding, designing, implementing and evaluating user-interfaces so that they better support users in carrying out their tasks. On completing the course you will have knowledge of the theoretical foundations of designing for interaction between humans and computers. You will also have practical experience in implementing and evaluating graphical user interfaces.

Contact: Professor Andy Cockburn

ENCE360 Operating Systems

15 points

ENCE360-12S2 (C)

This course provides an overview of the concept of operating systems. An operating system is the most important system software and manages all the resources of a computer. This course provides a detailed view of operating system functions such as process management, memory management, I/O management, file management and virtualisation. This course also provides information about concepts such as mutual exclusion, and concurrent processes. There is an emphasis on design, implementation, and evaluation of modern operating systems including mobile and real-time operating systems.

Contact: Dr Richard Green

ENCE361 Embedded Systems 1

15 points

ENCE361-12S1 (C)

Embedded Systems is the study of specialised computer hardware, such as microcontrollers, programmed to perform a series of tasks, typically using a high-level language such as C, and targeted towards dedicated applications.

Contact: Mr Steve Weddell (ENCE)

SENG301 Advanced Software Engineering

15 points

SENG301-12S1 (C)

In this course students will learn how to enact, tailor, and evaluate different types of software process. They will also learn how to design the products to be delivered by the process.

Contact: Dr Neville Churcher

SENG302 Software Engineering Group Project

30 points

SENG302-12W (C)

The Software Engineering group project gives students in-depth experience in developing software applications in groups. Participants work in small groups (typically six students) to develop a complex real application. At the end of this course you will have practiced the skills required to be a Software Engineer in the real world, including gaining the required skills to be able to develop complex applications, dealing with vague (and often conflicting) customer requirements, working under pressure and being a valuable member of a software development team.

Contact: Dr Warwick Irwin

SENG365 Web Computing Architectures

15 points

SENG365-12S2 (C)

This course introduces the fundamental concepts and techniques for developing applications that are delivered via the world wide web. Students will gain practical experience in developing software using a variety of current web application platforms, and will gain an understanding of the technical details of the underlying frameworks used and their implications when producing complex web-based software systems.

Contact: Dr Richard Lobb

400-level courses

The following courses are indicative only. Please check with the department for a list of current offerings, as changes may occur. For up to date information please refer to our website: www.cosc.canterbury.ac.nz

COSC 407 Wireless, Mobile and Network Security

COSC407-12S1 (C)

This course will provide a study of key security systems appropriate for TCP/IP, wireless mobile and multimedia networks and will include topics such as security in Wireless Personal Area Networks including Bluetooth Networks, Wireless Local Area Networks, Wireless Wide Area Networks, WiMAX wireless broadband access networks and MANs (Metropolitan Area Networks).

Contact: Associate Professor Ray Hunt

COSC 411 Advanced Topics in Human Computer Interaction

COSC411-12S1 (C)

This course investigates current research topics in HCI, with a focus on methods used to evaluate user interfaces.

Contact: Professor Andy Cockburn

COSC 413 Advanced Topics in Algorithms

COSC413-12S2 (C)

This course will give a clear explanation of NP completeness theory. Algorithms on number theory needed for the RSA cryptosystem will be presented in detail.

Contact: Professor Tadao Takaoka

COSC 415 Information and Software Visualisation

COSC415-12S2 (C)

In this course, topics covered will be drawn from information visualisation, software metrics, visualisation tools, techniques and languages (including VRML), and the visualisation of software systems.

Contact: Dr Neville Churcher

COSC 418 Special Topic: Wireless Ad-hoc and Sensor Networks

COSC418-12S2 (C)

This course will provide students with an understanding of wireless ad-hoc and sensor networks, enable them to recognise the wide range of applicability of these networks, and provide students with an understanding of the major design issues, including topics such as protocol mechanisms and resource constraints which affect their architecture.

Contact: Dr Andreas Willig

COSC 420 Intelligent Tutoring Systems

COSC420-12S1 (C)

This course addresses the use of artificial intelligence to create computer-based tutoring systems.

Contact: Professor Tanja Mitrovic

COSC 422 Advanced Computer Graphics

COSC422-12S1 (C)

This course of study covers some of the advanced concepts in computer graphics that are especially useful for three-dimensional modelling, rendering, animation and games programming.

Contact: Associate Professor R Mukundan

COSC 424 Secure Software

COSC424-12S2 (C)

This course is concerned with designing and implementing secure operating system and application software, that is, software that is not vulnerable to malicious attacks. This course particularly addresses web server security and the methodologies required to ensure web servers are not vulnerable to security breaches.

Contact: Associate Professor Ray Hunt

COSC 425 Computer & Network Forensics A

COSC425-12S1 (C)

This course covers the social, legal and technical aspects of cyber crime as well as the digital and network forensic techniques required to combat crime. The course studies the various types of tools used to carry out forensic examinations, and students have the opportunity to develop their own tools. Other topics include computer fraud, obtaining evidence - disk cloning techniques, recovery of data from destroyed media, disk and file encryption as well as toolkits and applications for forensic analysis.

Contact: Associate Professor Ray Hunt

COSC 426 Augmented Reality

COSC426-12S2 (C)

This course provides students with an introduction to the field of Augmented Reality, as well as a practical grounding in how to build AR interfaces.

Contact: Professor Andy Cockburn

COSC427-12S1 Advanced Object Oriented Design

COSC427-12S1 (C)

This course investigates the question "what makes a good OO design?" with emphasis on OO design principles, heuristics and patterns

Contact: Dr Warwick Irwin

COSC 428 Computer Vision

COSC428-12S1 (C)

This course encompasses the theory and practical applications of computer vision, including image processing (useful in early stages of computer vision, usually to enhance particular information and suppress noise) and visual cognition (computational models of human vision).

Contact: Dr Richard Green

COSC 429 Cybersecurity

COSC429-12S2 (C)

This course will provide an introduction to the subject of information warfare and its role in contemporary military thinking, and to understand the scope and limitations of information operations. Topics include malicious cryptography, embedded trapdoors, defensive and offensive information operations, network mapping and surveillance and practical analysis of contemporary cyber attacks.

Contact: Dr Dongseong Kim

COSC 430 Information Security & Access Management

COSC430-12S1 (C)

This course addresses issues and processes involved with managing the security of computer systems and networks, with a focus on key areas such as security risk assessment, security policy, identity and access management.

Contact: Dr Dongseong Kim.

COSC 433 Special Topic: Computer Science Education

COSC433-12S1 (C)

The goal of the course is to produce students who are well-informed about the wide ranging issues surrounding Computer Science education, are able to provide balanced and sound advice to computing teachers who have a weak background in Computer Science, and are able to develop and use effective resources themselves.

Contact: Professor Tim Bell

COSC 435 Computer and Network Forensics B

COSC435-12S2 (C)

This course covers the social, legal and technical aspects of cyber crime as well as the digital and network forensic techniques required to combat crime. The course studies the various types of tools used to carry out forensic examinations, and students have the opportunity to develop their own tools. Other topics include computer fraud, obtaining evidence -disk cloning techniques, recovery of data from destroyed media, disk and file encryption as well as toolkits and applications for forensic analysis. Contact: To be advised.

Contact: Associate Professor Ray Hunt

COSC 475 Independent Course of Study

COSC475-12S1/S2/W

Admission is subject to the approval of the Head of Department.

COSC486 Research Summer Project

COSC486

is based on a research project involving at least 150 hours of research work. The project gives students the opportunity to obtain, develop and demonstrate research skills in Computer Science and Software Engineering. Different projects will require and develop different research skills, so it is important to talk to members of the Computer Science & Software Engineering academic staff before committing to a particular project.

COSC 433-434, & COSC471-474

Selected Topics, as arranged.

Postgraduate Diploma in Science: Computer Security and Forensics

The following courses form the core for the Postgraduate Diploma in Science: Computer Security and Forensics.

Details of courses for this programme, and full information on its availability, are available on the CSSE department website:

www.cosc.canterbury.ac.nz/open/students/intending/pgforensics.html

Primary papers (Semester 1)

COSC 407 Wireless, Mobile and Network Security

COSC 425 Computer & Network Forensics A

COSC 430 Information Security & Access Management

Primary papers (Semester 2)

COSC 424 Secure Software

COSC 429 Cyber Security

COSC435Computer & Network Forensics B

Additional Papers

MATH 409 Cryptography 2

COSC 400-level

Other 400-level papers

Admission is subject to the approval of the Head of Department

Staff

Academic Staff

Person and Research Areas

Professor Tanja Mitrovic Head of Department

(Room 202, ext. 6352)

tanja.mitrovic@canterbury.ac.nz

www.cosc.canterbury.ac.nz/tanja.mitrovic

- Intelligent tutoring systems
- Machine learning
- Databases

Professor Tim Bell Deputy Head of Department

(Room 303, ext. 7727)

tim.bell@canterbury.ac.nz www.cosc.canterbury.ac.nz/tim.bell

www.cosc.canterbury.ac.nz/tim.bell

- Computers and music
- Public understanding of Computer Science
- Data compression

Dr Neville Churcher

(Room 247, ext. 7862)

neville.churcher@canterbury.ac.nz

www.cosc.canterbury.ac.nz/neville.churcher

- Software engineering
- Groupware
- Software metrics
- Databases

Professor Andy Cockburn

(Room 313, ext. 7768)

andy.cockburn@canterbury.ac.nz

www.cosc.canterbury.ac.nz/andrew.cockburn

- Human-computer interaction

Dr Richard Green (Room 245, ext. 8436)

richard.green@canterbury.ac.nz

www.cosc.canterbury.ac.nz/richard.green

- Computer Vision
- Segmenting motion
- Tracking complex articulated motion.
- Robot guidance and electric
- Robust tracking for cricket
- Public interactive displays and Biometrics

Associate Professor Ray Hunt

(Room 314, ext. 6347)

ray.hunt@canterbury.ac.nz

www.cosc.canterbury.ac.nz/ray.hunt

- Design of data communications networks
- Network protocols
- Network security
- Applied networks – performance and operation
- Digital and network forensics
- Wireless and mobile network security

Dr Warwick Irwin

(Room 212, ext. 8225)

warwick.irwin@canterbury.ac.nz

www.cosc.canterbury.ac.nz/warwick.irwin

- Software engineering
- Software reuse
- Software metrics
- Object-oriented software development

Dr Dong-Seong Kim

(Room 304, ext. 8402)

dongseong.kim@canterbury.ac.nz

www.cosc.canterbury.ac.nz/dongseong.kim

- Dependable & Secure Systems
- Computer & Network Security
- Virtualisation
- Cloud Computing Systems

Dr Richard Lobb

(Room 211, ext. 7859)

richard.lobb@canterbury.ac.nz

www.cosc.canterbury.ac.nz/richard.lobb

- Computer graphics
- Physically based modelling
- Scientific visualisation

Associate Professor Ramakrishnan Mukundan

(Room 311, ext. 7770)

mukund@cosc.canterbury.ac.nz

www.cosc.canterbury.ac.nz/mukundan

- Pattern recognition
- Moment invariants
- Terrain rendering

Professor Krzysztof Pawlikowski

(on leave July 2012 - July 2013)

(Room 301, ext. 7772)

krys.pawlikowski@canterbury.ac.nz

www.cosc.canterbury.ac.nz/krys.pawlikowski

- Multimedia telecommunication networks: their design and performance
- Teletraffic modelling for network performance and security
- Discrete-event simulation
- Peer-to-peer networks
- Information theory and data security

Professor Tad Takaoka

(Room 302, ext. 7773)

tad.takaoka@canterbury.ac.nz

www.cosc.canterbury.ac.nz/tad.takaoka

- Shortest path algorithms
- Approximate pattern matching
- Combinatorial generation
- Parallel Program Verification
- Maximum Subarray Problem

Dr Andreas Willig

(Room 310, ext. 7869)

andreas.willig@canterbury.ac.nz

www.cosc.canterbury.ac.nz/andreas.willig

- Wireless & mobile body sensor networks
- Energy-efficiency, cooperative communications, non-functional requirements
- (Hard-) Real-time networking, wireless industrial networks
- Protocol design and stochastic performance evaluation
- Wireless and mobile networking, general networking

Adjunct Staff

Professor Dr Ing. Phuoc Tran-Gia
(Room 321, ext. 4858)

phuoc.tran-gia@canterbury.ac.nz

- Analysis and Design of Advanced Multiservice
- Networks supporting Mobility
- Multimedia, and Internetworking
- Impacts of New Services on the Architecture and Performance of Broadband Networks.
- Traffic Characteristics and Performance
- Evaluation of Peer-to-Peer Systems.

Dr Greg Ewing

(Room 213, ext. 4827)

greg.ewing@canterbury.ac.nz

- Programming language design and implementation
- Operating systems
- 3D graphics

Professor Hai Jin

(Room 321, ext. 4858)

hijn@hust.edu.cn

- Cluster Computing and Grid Computing
- High Performance Storage Systems
- Network Security

Staff contributing to teaching from other departments

Professor Mark Billinghurst

(Room 106 HITLAB, ext. 6403)

mark.billinghurst@canterbury.ac.nz

- Wearable Computing
- Shared Space
- Multimodal Input

Dr Steve Weddell

(Room A313, ECE building, ext. 8072)

steve.weddell@canterbury.ac.nz

www.elec.canterbury.ac.nz/people/weddell.shtml

- Embedded Systems Control.
- Digital Signal Processing -Imaging and Control, Applications.
- Development Systems.
- Heterogeneous multiprocessor Systems.
- Systolic Computer Architectures.
- Digital Signal and Digital Image Processing.
- Uniprocessor and Multiprocessor simulation tools.

Research Position

Moffat Mathews

Research Fellow

Room 213, extension 4824

Post Doctoral Fellows

Dr Velibor Ilic (Room 346, ext. 7756)

Dr Ludger Bischofs (Room 343, ext. 7876)

Dr Sylvain Malacria (Room 344 ext. 7755)

General Staff

Senior Tutor

Ms Yalini Sundralingam (Room 322, ext. 8207)

Ms Amali Weerasinghe (Room 321, ext. 4858)

Ms Marina Filipovic (Room 321, ext. 4858)

Programmers

Dr Blair McMaster (Room 224, ext. 7763)

Mr Peter Glassenbury (Room 223, ext. 7762)

Mr Joffre Horlor (Room 222, ext. 7758)

Mr Adrian White (Room 221, ext. 7728)

Technician

Mr Phil Holland (Room 112, ext. 7754)

Administrators

Mrs Gillian Clinton (Room 204, ext. 6362)

Mrs Alexandra Forster (Room 201, ext. 8510)

Degree structure (BSc) for COSC majors

Typical structure (COSC major)	Courses/Points
<p>YEAR 1</p> <p>1. Required: COSC 121 and COSC 122</p> <p>2. Recommended: COSC 110 and MATH 120</p> <p>3. A further 30 points from Science courses</p> <p>4. 15 points from 2 other courses</p> <p>Total 120 points</p>	<p>15 x 2 = 30</p> <p>15 x 2 = 30</p> <p>15 x 2 = 30</p> <p>15 x 2 = 30</p> <p>15 x 8 = 120</p>
<p>YEAR 2</p> <p>1. Required: COSC 261 and ENCE 260 plus at least 30 more COSC points</p> <p>2. A further 30 points from COSC 200 level courses</p> <p>3. A further 15 points from any 200-level courses</p> <p>4. A further 15 points from any 100-level courses</p> <p>Total 120 point</p>	<p>15 x 4 = 60</p> <p>15 x 2 = 30</p> <p>15 x 1 = 15</p> <p>15 x 1 = 15</p> <p>15 x 8 = 120</p>
<p>YEAR 3</p> <p>1. Required: At least 60 points of 300-level COSC courses (ENCE360, ENE361, SENG301, SENG302, SENG365)</p> <p>2. A further 30 points of 300-level Science (for Hons these must also be COSC points)</p> <p>3. A further 30 points from any 200-level courses</p> <p>Total 120 points</p> <p>Required for Honours: At least 90 points of 300 level Computer Science, ENCE 360, ENCE 361, SENG 301, SENG 302, SENG 365</p>	<p>15 x 4 = 60</p> <p>15 x 2 = 30</p> <p>15 x 2 = 30</p> <p>15 x 8 = 120</p>

Create your own personalised Computer Science degree programme

Bolded courses are compulsory or strongly recommended. Others may be substituted, subject to restrictions. To assist with planning your courses, and to meet the degree requirements, use the Degree Structure above.

100-level COSC 121w 15 points	100-level COSC 122 15 points	100-level COSC 110 15 points	100-level MATH 120 15 points	100-level Science 15 points	100-level INFO 125 15 points	100-level (ANY) 15 points	100-level (ANY) 15 points
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Year 1 – total of 120 points

200-level COSC 261 15 points	200-level ENCE 260 15points	200-level COSC XXX 15points	200-level COSC XXX 15 points	200-level ANY SCIENCE 15 points	200-level ANY SCIENCE 15 points	200-level (ANY) 15 points	100-level (ANY) 15points
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Year 2 – total of 120 points – (this must include a minimum of 45 COSC points)

300-level ENCE 360 15 points	300-level ENCE361 15 point	300-level SENG 301 15 points	300-level SENG 302 15 points	300-level SENG 365 15 points	300-level ANY SCIENCE 15 points	200-level ANY 15 points	200-level ANY 15 points
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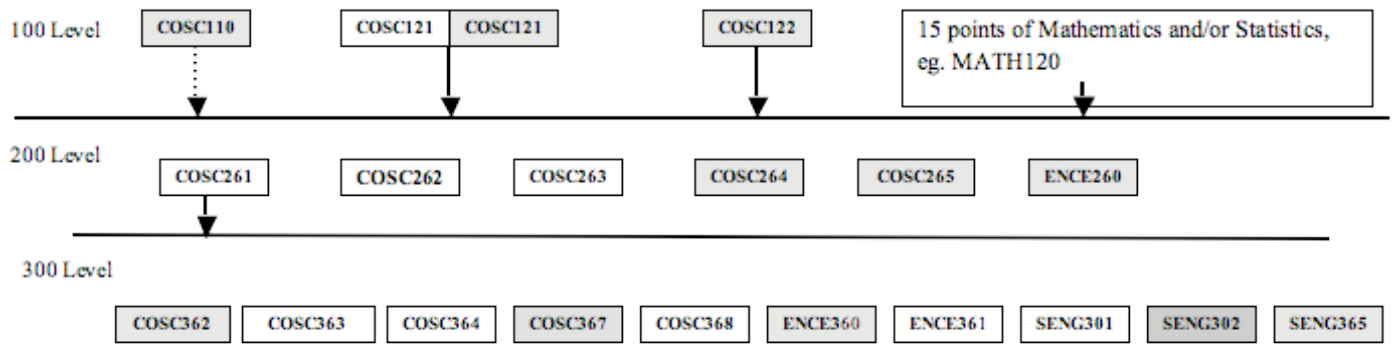
Year 3 – total of 120 points ñ (this must include a minimum of 60 COSC points and at least 90 COSC points of 300 level Computer Science - ENCE360, ENE361, SENG301, SENG302, SENG365) for Honours) Total in 3 years = 360 points

Students taking an Engineering Intermediate Programme should consult the College of Engineering for advice.

Students close to finishing and find they don't have enough points should contact the College of Science for advice.



Course structure



Prerequisite Recommended Whole year Semester 1 Semester 2

At least 4 courses at 200-level COSC and 30 points of MATHS and/or STATS (MATH101 is not acceptable) are required for all 300-level COSC courses. COSC110 is highly recommended.

Contact

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