CONTENTS

CONTACT DETAILS

School of Engineering and Computer Science
Te Kura Mātai Pūkaha, Pūrorohiko

Location: Cotton Building, P.O. Box 600, Kelburn Parade, Wellington
School Office: Cotton Building, Floor 3, Room 358.
Office Hours: Mon-Fri 8.30am to 5pm.
Telephone: (04) 463-5341 from NZ +64-4-463-5341 from overseas
Fax: (04) 463-5045 from NZ +64-4-463-5045 from overseas
Email office@ecs.vuw.ac.nz
Website: http://ecs.victoria.ac.nz

STAFF	RESEARCH INTERESTS	ROOM	CONTACT
Deans and HoS			
Prof John Hine	Dean of Engineering and Head of School	CO342	463 5670
Prof Dale Carnegie	Deputy Head of School	LB502	463 7485
Shona de Sain	Associate Dean (Students)	CO158	463 5092
Liz Richardson	Deputy Dean (Equity)	CO150	463 5748
A/Prof Mengjie Zhang	Associate Dean (Postgraduate Research)	CO427	463 5654
Graduate Studies Coordinators			
Dr Marcus Frean	Graduate Coordinator (Coursework programs)	CO443	463 5672
Dr Pavle Mogin	Adviser and Admission to International Graduate Students (Coursework programs)	CO260	463 5655
A/Prof Mengjie Zhang	Thesis Coordinator (Thesis/research programs)	CO427	463 5654
Academic Staff			
Dr George Allan	Epistemology of Project Management, Risk Management	CO230	463 5233 x8488
Dr Peter Andreae	Artificial Intelligence	CO429	463 5834
Prof Paul Austin	Control Systems Engineering	CO253	
Prof Robert Biddle	Software Engineering	(Adjunct Professor)	
Dr William Browne	Robotics, Computer systems engineering	CO354	
Dr Kris Bubendorfer	Mobility and Distributed Systems	CO338	463 6484
Dr Nicholas Cameron	Programming Language Theory and Design	CO252	463 6765
Prof Dale Carnegie	Mechatronics, Digital Electronics, Embedded Controllers	LB502	463 7485
Dr Pawel Dmochowski	Wireless Communications, Signal Processing	CO355	463 5948
Dr Robin Dykstra	Instrument Development, NMR systems	CO353	463 5233 x7508
Dr Marcus Frean	Machine Learning, Theoretical Biology	CO443	463 5672
Dr Qiang Fu	Internet Protocols, Wireless and Mobile Systems, Network Measurement and Security	CO329	463 5233 x8829
Dr Achim Gädke	NMR Instrumentation	FT88/109	463 5233 x8874
Dr Xiaoying Gao	Artificial Intelligence	CO442	463 5978
Dr Gideon Gouws	Sensors and Sensor Systems, Dynamic Systems and Control	LB505	463 5952
A/Prof Lindsay Groves	Formal Software Development	CO257	463 5656
Prof John Hine	Distributed Systems, e-Research	CO342	463 5670
Dr Chris Hollitt	Autonomous Mobile Robots	CO341	463 6965

Dr Peter Komisarczuk	Communications, Networks, Distributed Systems	CO339	463 5661
A/Prof Thomas Kühne	Software Engineering	CO233	463 5443
Dr Wei Li	Network Engineering	CO331	
Andy Linton	Network Building and Management, Internet Governance	CO330	463 5114
Dr Hui Ma	Databases	CO259	463 5657
Dr Petra Malik	Formal Software Engineering, Open Source	CO258	463 5820
Dr Stuart Marshall	Component Reuse, Software Visualisation	CO261	463 6730
Dr Pavle Mogin	Database Systems	CO260	463 5655
Dr Mark Moir	Practical and Theoretical Aspects of Concurrent, Distributed, and Real-time Systems	(Adjunct Professor)	
Prof James Noble	Object-Oriented Software Design	CO234	463 6736
Dr David Pearce	Graph Algorithms, Program Analysis	CO231	463 5833
Dr Alex Potanin	Ownership and Immutability, OO Programming Languages, Type Systems, Software Engineering	CO262	463 5302
Prof Winston Seah	Network Engineering, Wireless Systems	CO336	
Dr Mansoor Shafi	Wireless Communications Systems	(Adjunct Professor)	
Dr Paul Teal	Signal Processing and Communications	CO352	463 5966
Dr Ian Welch	Security and Distributed Systems	CO337	463 5664
A/Prof Mengjie Zhang	Data Mining and Machine Learning, Genetic Programming, Evolutionary Computer Vision	CO427	463 5654

INFORMATION

Welcome to the School of Engineering and Computer Science, a leading research department in New Zealand that stands proudly on the world stage with its distinguished faculty and research output. We back up our research with access to sophisticated, cutting-edge equipment including the ability to run simulations on the University of Canterbury Blue Gene supercomputer, and our own extensive grid computing initiative. We are a member of KAREN, facilitating high-speed network access throughout New Zealand and connectivity to the world's research networks.

We encourage anyone interested in graduate study to contact a relevant staff member directly by email (*Firstname.Lastname*@ecs.vuw.ac.nz). We are open to receiving your proposals for PhD and Master's projects and provided that we have the appropriate resources and supervisory experience available, we will consider these most positively.

We look forward to hearing from you!

Graduate Admission and Enrolment Procedures

Enrolment Application Forms for NZ residents may be obtained from Student Enrolments: **http://www.victoria.ac.nz/home/prospective_students/**

International students should consult the International Student office (see below).

Applicants for PhD thesis and Master thesis programmes are advised to discuss their proposed enrolment with a member of the Engineering and Computer Science staff, either in person or by mail/email. Applicants with qualifications not from VUW should bring/include a copy of their transcript and details of courses they have taken. Postgraduate application forms for thesis students can be downloaded from **http://www.victoria.ac.nz/home/studying/enrol_postgraduate.html**

International students, for whom English is not their first language, should also bring/send a copy of their IELTS or TOEFL scores.

International Students

Students from overseas are welcome in the School. Victoria International is the University's office for international students. The International Office has a website at **www.victoria.ac.nz/international** that provides much information on application and immigration formalities, scholarships, NZ living costs, fees, academic programmes and the like. You can contact Victoria International on-line through this website, or send an email to victoria-international@vuw.ac.nz

Important note on tuition fees for international students:

International students accepted for the PhD degree currently pay the same fee as domestic students. For other degrees and diplomas, international students from Australia also pay the same tuition fee as New Zealand students, but students from other countries pay the full international student fees. Some thesis students may have their fees paid from a scholarship or from the research grants of their supervisors.

PhD Students from 2010

The admission and scholarship application methods for prospective PhD students will be changed from 1 January 2010. The admission application and scholarship application for PhD students until 2010 were two separate processes. From 2010, the two separate processes will be merged to a single process: the prospective PhD students can indicate on their admission application whether they want to apply for a scholarship from the university or not.

From 2010 there will be three deadlines for all PhD applications to be considered. The proposed dates are 1 March, 1 July and 1 November. Students may complete an application form and speak with prospective supervisors prior to the deadline, but their application must be submitted through the Faculty of Graduate Research (FGR) and formal acceptance into the programme will be made after the deadline. More information can be seen from the FGR web site:

http://www.victoria.ac.nz/phd

This admission/scholarship application process applies to both domestic and international prospective PhD students. The processes of all other programs such as Masters, Honours, Diplomas and Certificates will remain unchanged.

Note: Every effort will be made to ensure that enrolment in the PhD degree is flexible where there is a demonstrated need such as for those candidates who have funding or a scholarship from their own country or institution which must be taken up within a particular timeframe. Please contact our academic staff members or the postgraduate thesis coordinator at any time to discuss these issues and we will endeavour to manage your enrolment as quickly as we can.

GRADUATE PROGRAMMES IN ENGINEERING AND COMPUTER SCIENCE AT VUW

Victoria University of Wellington is committed to maintaining a high standard of excellence in its teaching and research. Engineering and Computer Science are complex and fast moving disciplines. Whilst the undergraduate degrees provide an excellent platform for careers in Engineering or Computer Science, it is impossible to cover the full breadth and depth of these dynamic disciplines in three or four years. Further, the knowledge of an engineering professional erodes at a rapid rate, requiring constant refreshing to maintain its currency. The Engineering and Computer Science graduate programmes bring together fresh graduates, experienced professionals, and ongoing research programmes.

The School of Engineering and Computer Science offers a variety of graduate programmes. These

programmes require an undergraduate qualification in Engineering, Computer Science or an equivalent. They are suitable for new graduates seeking an advanced degree before entering the work force, professionals with an Engineering or Computer Science background seeking a more advanced professional qualification (possibly on a part-time basis), and graduates seeking research based qualifications in order to enter research or academia. Programmes for students who do not have a first degree in Engineering or Computer Science are described on Page 10; these may be taken as preparation for graduate study in Engineering or Computer Science or as a qualification in their own right.

The graduate programmes offered include the following degrees and diplomas:

BSc(Hons) in Computer Science or in Electronic and Computer Systems Engineering. This degree is the traditional first graduate degree after a BSc in Computer Science or in Electronics and Computer Systems and involves one year of full time (or two years part-time) study combining course and project work.

BSc(Hons) or BA(Hons) in Logic and Computation. These graduate degrees involve one year of full-time study in a combination of Computer Science, Mathematics, and Philosophy.

PGDipSc in Computer Science, or Electronic and Computer System Engineering, or Logic and Computation. This diploma is a post-graduate qualification. The PGDipSc will appeal to students wanting a post-graduate course-work qualification. A research project is not compulsory. The PGDipSc also provides an opportunity for those students who are not able to meet the entry requirements for the BSc (Hons) or MSc Part 1. The PGDipSc requires 120 points of post-graduate study and can be completed full-time in 2 trimesters or part-time up to 4 years.

GDipSc in Computer Science, or in Electronic and Computer Systems. This diploma is a graduate programme equivalent to one year of full-time study that can consist entirely of course work at 200 and 300 level, but (with permission) may include 400-level courses and/or a project**.**

GDCompSc (Graduate Diploma in Computer Science). This diploma is a graduate programme equivalent to one year of full-time study that consists of 8 courses from COMP 200-488, including at least five at 300-level or above. **(No new enrolments in 2010)**

PGCertSc (Postgraduate Certificate of Science) in Computer Science, Electronic and Computer Systems Engineering, or Logic and Computation. This certificate is a short postgraduate qualification that consists of 60 point courses from COMP, SWEN, NWEN, ECSE, MATH, PHIL at 400-level (or ECSE 580).

ME (Master of Engineering). This is a master's degree involving a thesis in engineering with or without a specific area such as electronic and computer system engineering, network engineering, and software engineering. It consists of either a 120 point Master thesis or a 90 point thesis plus 30 points of 400 or 500-level courses from the ME or BE schedule.

MCompSc (Master of Computer Science). This master's degree is centred on course work completed over two years (or a longer period on a part-time basis).

MSc (Master of Science) in Computer Science or in Electronic and Computer Systems Engineering. This master's degree has two parts. Part 1 is one year of full time study consisting of course work. Part 2 is a thesis which typically requires 12-18 months of study. Students with an honours degree (including a BE with honours) or a PGDipSc take Part 2 only. Students with a BSc need to take both parts 1 and 2.

PhD (Doctor of Philosophy). The PhD is a research degree, involving a substantial thesis, and is open to students with a good four-year qualification in Engineering or Computer Science.

COP - students with an appropriate background may take individual courses without having to work towards a qualification. Students receive a Certificate of Proficiency for each such course.

Figure 1 indicates how the various degree programmes relate to the undergraduate BSc and BE, and to each other. Candidates normally progress along the paths indicated by the solid arrows and can by permission progress along the paths indicated by dashed arrows. Previous professional experience can be taken into account.

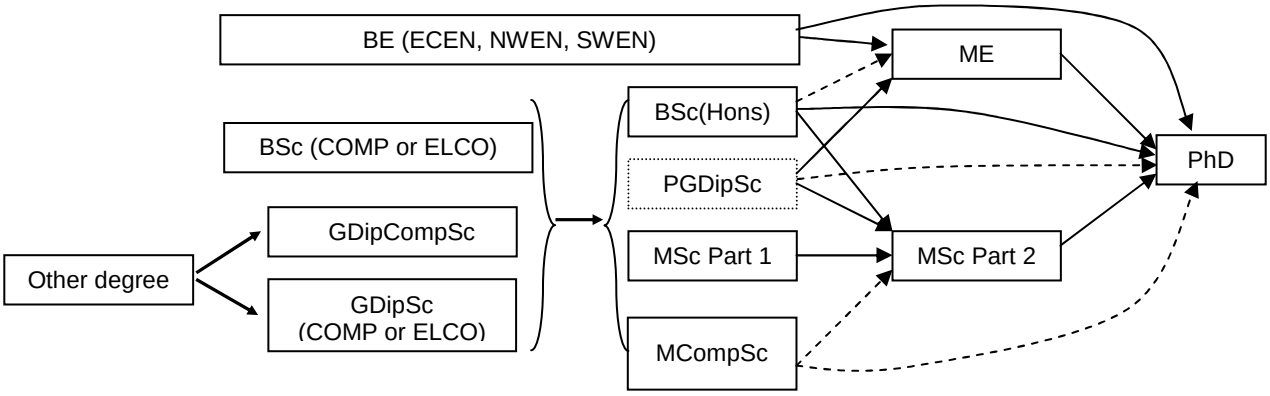

Figure 1: Relationship between degree programmes

The BSc (Hons), MCompSc, and MSc Part 1 and PGDipSc consist of courses on advanced topics in engineering and computer science. Students are able to study technology that is just finding its way into commercial implementations and concepts that will form the foundations for future technology and solutions. This combination of material prepares our students for a successful career in areas such as software design and development, network or systems planning and management, electronics and computer systems, or for study towards a further degree. An overview of individual graduate courses can be found starting on page 12**.**

The MSc Part 2, ME and PhD are all research degrees featuring a substantial research project leading to a thesis. Thesis projects are supervised by academic staff and are normally related to staff research.

Each of these programmes is described briefly below, including an indication of who the programme is designed for, the programme goals, the prerequisites for entry, and the requirements for completion of the programme. For the complete regulations regarding these programmes, we refer you to the appropriate pages of the Victoria University Calendar, available online at: http://www.vuw.ac.nz/publications/calendar/ or http://www.victoria.ac.nz/home/study/calendar.aspx/.

BSc(Hons)

The BSc Honours degree is the traditional first step beyond the undergraduate degree and is typically taken immediately following completion of a BSc. It comprises one academic year of full-time study. With permission, it can be undertaken part-time over two years.

BSc(Hons) in Computer Science

Entry requirement. The BSc(Hons) in Computer Science is designed both for students wishing to complete a stronger major in Computer Science before entering the work force and as a first step for students intending to pursue a research degree (MSc or PhD). Entry to the degree requires a first degree and at least 60 points in 300-level courses in Computer Science. Applicants should have attained a good standard of performance in their final year of study (normally an average grade of B+ or higher in relevant 300-level courses), and should have completed any specific prerequisites for their proposed courses of study.

Candidates are required to complete 120 points, which **must** include COMP 489 (a 30-point research project), and **usually** includes a further 90 points from Computer Science (including COMP, NWEN and SWEN) 400-level courses. Up to 60 points may be replaced by graduate courses from other disciplines and up to 30 points of approved 300-level courses. Whilst we encourage Honours students to enrich their education with advanced courses in other subjects, substitution of courses will only be permitted if the complete set of courses constitutes a coherent programme of study.[1] Recent graduate students have taken courses in mathematics, philosophy (logic), linguistics, information systems, and physics (electronics).

BSc(Hons) in Electronic and Computer System Engineering

This programme is ideal for graduates with a BSc in Electronic and Computer Systems. The entry requirement is 60 points in approved 300-level or higher courses from BE schedule or 300-level courses in COMP or PHYS. Candidates are also required to complete 120 points, which **must** include ECSE 425 (or ECEN 425), ECSE 430 (or ECEN 430), ECSE 489 (a 30-point research project), and further 60 points in an approved combination from 400-level courses from the BE Schedule.

BSc(Hons) or BA(Hons) in Logic and Computation

The BSc(Hons) and BA(Hons) in Logic and Computation are designed for students seeking a graduate level qualification in the major concepts and methods of logic and their use in aspects of Computer Science, Mathematics, and Philosophy. Entry to these programmes requires a first degree, including at least 48 points in approved 300-level COMP, SWEN or MATH courses.

The BSc Honours degree in Logic and Computation consists of 120 points in approved combination from COMP 401-489, SWEN 401-489, MATH 401-489, PHIL 421 and 422, including at least 60 points from COMP 425, 426 (SWEN421), 432 (SWEN431), MATH 409, 433-435, 439 and PHIL 421 and 422. Up to 30 points may be replaced by approved 300-level courses not previously passed.

See the prospectus for Graduate Study in Logic and Computation for further information on these programmes.

Note: it is possible, though not compulsory, to take a project as part of LOCO Honours.

MCompSc

The Master of Computer Science degree is a graduate qualification designed for professionals seeking to advance their knowledge of Computer Science and to obtain a formal qualification that recognises their achievement. The degree will also be attractive to new graduates who wish to advance their knowledge of Computer Science before seeking employment. The degree emphasises course work as opposed to a significant research thesis.

Entry to the MCompSc requires a degree with the equivalent of 60 points of 300-level courses in Computer Science. The Graduate Diploma in Science (Computer Science) is one way of satisfying this prerequisite for candidates who have a degree in a subject other than Computer Science. In exceptional cases, substantial professional experience combined with a degree containing less Computer Science will be acceptable. Applicants should have demonstrated the ability to study at an advanced level, through either their previous study or work experience. Applicants who did not complete their previous study at VUW should pay particular attention to the prerequisite requirements of individual courses.

Candidates are required to complete 12 courses and a project (COMP 588). The courses are normally 400-level Computer Science (COMP/NWEN/SWEN) courses, but may include up to three approved 300-level courses. 400-level courses from other disciplines may also be included provided

[1] Please refer to the University Calendar for the exact details of what substitutions are possible.

they are relevant to the programme of study and approved by the Graduate Coordinator or Computer Science. The degree is available part-time over 6 years, or full-time over 16 months to 2 years. (Students would need to complete the project over a summer in order to complete within 16 months, but note that summer projects are not always available.)

ME (Master of Engineering)

The ME degree provides a clear route for continued study for graduates with a BE degree. The ME programme provides students with both a very attractive professional qualification in the engineering fields as well as opportunities to carry out a significant piece of research in engineering. Entry to this programme normally requires a BE degree with first or second class Honours from VUW or equivalent.

The ME programme consists of either

- A 120 point Masters thesis (ENGR 591), or
- A 90 point Masters thesis (ENGR 592), and 30 points of approved 400-level or 500-level courses from the schedules to the BE or ME.

Schedule to the ME Statute

ENGR 581	Directed Individual Study	15 points
ENGR 582	Directed Individual Study	30 points
ENGR 591	Thesis	120 points
ENGR 592	Thesis	90 points

The ME program can be taken with or without specific endorsed areas such as ECEN, NWEN and SWEN. To be eligible for the award of Distinction or Merit, a candidate should complete work required for the degree within 18 months. For part-time students, the period may be extended pro rata to a maximum of three years.

MSc in Computer Science

The MSc is a postgraduate degree with a thesis as a major component. The degree is designed to provide an advanced level of professional competence with some research experience. Individuals seeking advanced abilities in one or more areas of Computer Science and research experience in a specialised area of Computer Science will find the MSc programme attractive.

The MSc degree is divided into two parts:

- Part 1 is similar to the PGDipSc and the BSc Honours year (without requiring a project).
- Part 2 consists of a thesis, equivalent to one year's full-time study.

Applicants seeking entry to Part 1 need to meet the entry requirements set out for the BSc Honours degree above and satisfy the Graduate Coordinator of Computer Science that they have the prospect of successfully completing the MSc thesis. Applicants who have already completed an Honours degree in Computer Science, or the equivalent (such as a Bachelor of Information Technology degree awarded with Honours), and have the prospect of successfully completing the MSc thesis, may gain direct entry to Part 2.

Candidates for Part 1 are required to complete 120 points. These points normally come from 400-level Computer Science and Engineering (COMP/NWEN/SWEN) courses, but may include up to 30 points from approved 300-level courses. Courses from other disciplines may be included provided the complete set of courses constitutes a coherent programme of study.

Full-time candidates taking both part 1 and part 2 must complete the degree within two and a half years, extended pro-rata up to five years for part-time candidates. Full-time candidates for Part 2 only must complete the degree within 18 months, extended pro rata up to three years for part-time candidates.

MSc in Electronic and Computer System Engineering

The MSc in Electronic and Computer System Engineering deals with topics at the intersection of computer science and electronics. With embedded controllers existing in almost all of modern-day electronics, the distinction between software and hardware is becoming blurred. Expertise exists at Victoria University in communications, electronic design, network and software design, artificial intelligence, mechatronics and robotics, and signal processing. This two-year programme offers students the opportunity to explore all of these topics in a manner which best suits their interests. Issues of design, human-machine interfacing, control and machine learning and adaptability are at the core of this MSc.

Entry requirements are the same as BSc (Hons) in ECSE. The Programme is divided into two parts. Part 1 consists of 120 points including ECSE 425 (or ECEN 425), ECSE 430 (or ECEN 430), ECSE 580 and further 60 points in an approved combination from 400-level courses in the BE Schedule. Part 2 is a major research project spanning 12 to 15 months. Students who have entered the degree with a satisfactory academic background (typically a BSc(Hons) or equivalent degree) may enroll directly in Part 2. Part 2 consists of only a Master's Thesis (ECSE 591), which is typically full-time 12 to 15 month research project.

MSc in Logic and Computation

For full details of the MSc in Logic and Computation, see the separate Logic and Computation prospectus (http://msor.victoria.ac.nz/Main/StudentInformation#Prospectuses).

Postgraduate Certificate in Science

This PGCertSc provides an alternative path of postgraduate study in Science for students wanting a short course work postgraduate qualification. The certificate is suitable for those students who are not admitted to the BSc (Hons) and MSc Part 1 and/or who do not want to take a PGDipSc or want to exit earlier from the PGDipSc. A candidate in PGCertSc shall normally be enrolled for at least one trimester and shall complete the requirements within two years. This program is also suitable for those who want to complete postgraduate study in a focused area within a short timeframe while in full-time work or managing other commitments.

The School provides three subjects for the PGCertSc:

PGCertSc in Computer Science requires 60pts in approved courses from COMP, NWEN and SWEN 401-489.

PGCertSc in Electronic and Computer System Engineering requires ECSE 425 (or ECEN 425), ECSE (or ECEN 430), and further 30pts from an approved combination of 400 level courses from the BE Schedule, ECSE 489, and ECSE 580.

PGDipSc in Logic and Computation requires 60pts in approved courses from COMP 425, COMP 426 (SWEN421), COMP 432 (SWEN431), MATH 409, 433-435, and PHIL 402.

Postgraduate Diploma in Science

PGDipSc is a post-graduate science qualification offered in all subjects offered for the MSc. Entry to this qualification usually requires a degree of this University or another university that satisfies the prerequisites for the required courses. The candidates who do not quite meet the above entry requirements but with extensive practical, professional or scholarly experience will also be considered.

The PGDipSc also provides an opportunity for those students who are not able to meet the entry requirements for the BSc (Hons) or MSc Part 1. It will appeal to students wanting a post-graduate course-work qualification as a research project is not compulsory. The PGDipSc requires 120 points of post-graduate study and can be completed full-time in 2 trimesters or part-time over 4 years. The

students who have successfully completed a PGDipSc can take a thesis program (MSc Part 2, ME or PhD) directly.

The School provides three subjects for PGDipSc:

PGDipSc in Computer Science requires 120pts in approved courses from COMP, NWEN and SWEN 401-489.

PGDipSc in Electronic and Computer System Engineering requires ECSE 425 (or ECEN425), ECSE 430 (ECEN 430), and further 90 points from an approved combination of 400 level courses in the BE Schedule, ECSE 489, and ECSE 580.

PGDipSc in Logic and Computation requires 120pts in approved courses from COMP, SWEN 401-489, MATH 401-489, PHIL 402, including at least 60pts from COMP 425, COMP 426 (SWEN421), COMP 432 (SWEN431), MATH 409, 433-435, and PHIL 402.

PhD

The PhD degree is an internationally recognised research qualification that usually involves three to four years of original research work. A PhD is generally required by those people seeking careers in a university or research laboratory such as one of the Crown Research Institutes. A number of private companies and government departments also carry out research and seek new employees with a PhD.

The PhD degree is designed to encourage original thought and teach disciplined research techniques. PhD candidates are frequently employed in the School as teaching assistants and gain valuable experience in teaching and communicating their knowledge. Thus the skills acquired in pursuit of a PhD are often applicable in careers other than research.

Applicants should normally have either an Honours or Masters degree in Engineering or Computer Science, or a closely related discipline, with at least second class (first division) honours. Applicants will also need to propose, in general terms, a research project that can be supervised by a member of Victoria University staff. Several months of preliminary work including background reading, discussions with prospective supervisors, and preparation of a research proposal might be required before a candidate is accepted.

Students interested in pursuing a PhD are encouraged to discuss their plans with the Thesis Coordinator, and with staff who may supervise their research.

COP

Students who do not want to complete a degree or diploma may take courses individually for a Certificate of Proficiency, as long as they have satisfied the prerequisites for the course(s) they wish to take. Such courses may (with certain restrictions) be credited later to a graduate degree.

PROGRAMMES FOR GRADUATES OF OTHER DISCIPLINES

Graduates of disciplines other than Engineering and Computer Science will need the equivalent of a BSc in Computer Science or a BE in Electronic and Computer System Engineering, Network Engineering or Software Engineering before entering a postgraduate programme. The central requirement is the equivalent of 60 points of COMP, ECEN, ECSE, NWEN and/or SWEN courses at the level of the final year (300-level) of undergraduate study. For some students the appropriate way of achieving this will be the Graduate Diploma in Science containing appropriate COMP, ECEN, ECSE, NWEN and/or SWEN courses. For other students, cross-crediting from a previous qualification means that a BSc may require only a few more courses than are required for the GDipCompSc or GDipSc in Computer Science or Electronic and Computer Systems.

GDipCompSc

No new enrolments in 2010.

Candidates for the GDipCompSc must complete a total of eight courses, chosen from 200-, 300-, and 400-level courses in Computer Science (COMP, NWEN and SWEN). The Diploma may be studied either full-time or part-time; however, all the 300-level courses involve 200-level prerequisites which means that very few students are able to complete the diploma in one full-time year. Most students need to take at least a year and a half to two years, if not three years.

Graduate Diploma in Science

The Graduate Diploma in Science is designed for students with a degree, seeking a one year graduate programme with less of a research focus than the BSc (Hons). It can be taken either full-time or part-time, and can be taken with or without a specialisation. The GDipSc has no requirement for 400-level courses or a project, and is not a postgraduate level programme. This program shall consist of courses worth at least 120 pts above 100-level from the BSc schedule, including at least 75 pts at 300-level. In addition, up to 30pts may be replaced by approved courses from other programmes at this University.

The diploma may be generic or endorsed by specific areas. The School provides two endorsements to the GDipSc: Computer Science, Electronic and Computer Systems.

Prerequisites

All 200-level COMP courses have a prerequisite of COMP 103. Candidates who do not have the equivalent of COMP 102 and COMP 103 will need to take these courses before starting their GDipCompSc. Candidates with little mathematics background may also need to take MATH 151 or MATH 161 since this is also a prerequisite for half of the 200-level COMP, NWEN, or SWEN courses and most of the 300-level courses. Detailed descriptions of all undergraduate courses including COMP 102 and COMP 103 are provided in the Undergraduate Prospectus. Candidates for the GDipCompSc who are not sure whether they have sufficient background to go directly to the 200-level COMP courses should complete the self test at the end of this booklet. In our experience, the majority of GDipCompSc students do need to take at least COMP 103, even if they have had several years of work experience in the computing industry.

In planning their programme, students should note the prerequisites of the undergraduate courses, Note: also that the trimesters in which the courses are taught may also restrict the possible programmes.

Graduate Programmes in Information Systems

The School of Information Management (SIM) offers several qualifications that may appeal to students who are more interested in information systems rather than in computer science. Their graduate programmes are designed for people who wish to develop expertise in managing information and information technologies in a corporate environment. The Master of Information Management (MIM) is a post-experience qualification and students need at least three years of appropriate work experience. In contrast to the Computer Science graduate programmes described above, the MIM has a strong management orientation and is aimed at people who want to become effective managers or executives. SIM also offers a BCA (Hons) and an MCA in Information Systems. For students without a degree in Information Systems, the transitional Graduate Diploma in Commerce in Information Systems may be of interest. Contact the School of Information Management for more information about these programmes: http://www.sim.vuw.ac.nz/degrees/

GRADUATE COURSES

The School offers a number of graduate level courses for the BSc (Honours), MSc and MCompSc degrees. Most of these courses reflect the research interests of the Computer Science staff and build on top of the third year undergraduate courses. Candidates for these courses are assumed to have a general background in undergraduate computer science, in addition to any specific prerequisites indicated.

The offering of graduate courses is subject to availability of staff, and not all courses will be offered in any given year. The following list shows the courses that we are currently expecting to be able to offer in 2010. However, there may be late changes to this list; please check with the school.

Note that in special cases, students may be permitted to take one (or two in exceptional cases) "reading" course(s) from the courses that are not being offered in a given year, but we make no guarantee that such courses will be available. Students should consult the School's web pages at http://ecs.vuw.ac.nz for details (including prerequisites) and a timetable.

Admission to any graduate course requires the approval of the School. Students wishing to undertake graduate study should consult the School office prior to enrolment regarding the availability of the courses they wish to take and their eligibility to enrol in those courses.

COMP/NWEN/SWEN 400-Level Courses

COMP 421	CRN 986	**Machine Learning**	15 POINTS	**Tri 1**
Coordinator:		Dr Marcus Frean		
Prerequisites:		30 pts from COMP 301-399, ECEN 301-309, SWEN 301-399, NWEN 301-399 including COMP 307		

This course covers a range of topics in machine learning, with a focus on methods that provide tractable inference under uncertainty. Topics include neural networks, reinforcement learning, unsupervised learning, belief nets and particle filters, all viewed from the perspective of probability theory and optimization. The ideas are applied to data from a variety of sources, involving problems in pattern recognition, classification, and robotic control.

COMP 422	CRN 2324	**Data Mining, Neural Networks and Genetic Programming**	15 POINTS	**Tri 2**
Coordinator:		A/Prof Mengjie Zhang		
Prerequisites:		30 pts from COMP 301-399, ECEN 301-399, SWEN 301-399, NWEN 301-399 including COMP 307		

This course is concerned with data mining concepts and techniques, especially neural networks and genetic programming. It mainly focuses on the following topics: data mining and knowledge discovery in databases; data mining techniques such as nearest neighbour, naive Bayes, support vector machines, neural networks, genetic algorithms and genetic (automatic) programming; image analysis operations such as feature extraction and image recognition; and performance evaluation of data mining/ machine learning/image recognition systems. The course considers applications ranging from general classification, clustering and optimisation tasks to engineering applications.

COMP 423 CRN 4962 **Intelligent Agents** 15 POINTS **Tri 1**

Coordinator: Dr Xiaoying (Sharon) Gao
Prerequisites: 30 pts from COMP 301-399, ECEN 301-399, SWEN 301-399, NWEN 301-399 including COMP 307

This course examines construction of intelligent agents - software programs that can act for themselves in some part of the human world. This course focuses on agents for improving web search and includes topics such as agents for information extraction from the web, web page clustering and classification, automatic query expansion and web page ranking.

COMP 425 CRN 990 **Computational Logic** 15 POINTS **Tri 1**

Coordinator: A/Prof Lindsay Groves
Prerequisites: 30 pts from COMP 301-399, SWEN 300-399, NWEN 301-399; MATH 309 or PHIL 234/334 (or 211) recommended

This course is concerned with the application of formal logic to problems in Computer Science, and with techniques for mechanising logical reasoning. Topics may include: systems of reasoning; logic programming; the application of temporal and modal logics; and the relationship between proofs, programs, specifications and types.

COMP 471 CRN **Special Topic** 15 POINTS **Tri 1**

Coordinator: to be announced
Prerequisites: Approval of Head of School

A special topic in Computer Science.

NWEN 401 **Distributed Systems Design** 15 POINTS **Tri 1**

Coordinator: Dr Peter Komisarczuk
Prerequisites: Two of NWEN 301, 302, 303 (or COMP 305, 306, 310);
Restrictions: COMP413, ECSE 431
Textbook: "Distributed Systems: Principles and Paradigms", Andrew S. Tanenbaum and Maarten van Steen, Prentice Hall, 2nd Ed. (2007).

This course presents the concepts and principles used in the design and construction of distributed systems using practical examples, such as Peer-to-Peer, web and object oriented systems and exploring the protocols, algorithms and networking principles of such systems. The course provides a suitable knowledge base for those aiming to become researchers or developers of advanced systems and applications.

NWEN 402 **Internet Engineering** 15 POINTS **Tri 2**

Coordinator: Dr Peter Komisarczuk
Prerequisites: NWEN 302 (or COMP 306), one of NWEN 301, 303 (or COMP 305, 310);
Restrictions: COMP 417

This course addresses the use of important hardware and software technologies in the design and engineering of modern Internet applications and infrastructure. These aspects are explored through practical group work that can incorporate distributed systems, network and Internet technology, lectures and seminars. The course includes perspectives on the impact of economic, political and technical issues on Internet engineering that are explored through case studies and recent professional and research literature.

NWEN 403	**Advanced Network Engineering**	15 POINTS **Tri 1**
Coordinator:	Dr Qiang Fu	
Prerequisites:	NWEN 302 (or COMP 306), one of NWEN 301, 303 (or COMP 305, 310); or ECEN 320	
Restrictions:	COMP 414, ECSE 432	

This course extends the computer networking taught in NWEN302, Computer Network Design, providing extended coverage of network research, development and design and providing network case studies in Internet deployment, Next Generation Networks and network services and management. The course is designed for those aiming for careers that involve network engineering or network research.

NWEN 404	**Mobile Computing**	15 POINTS **Tri 2**
Coordinator:	Dr Winston Seah	
Prerequisites:	NWEN 302 (or COMP 306), one of NWEN 301, 303 (or COMP 305 or 310), or ECEN 320 (or CSEN 303)	
Restrictions:	COMP 414, ECSE 432 (prior to 2008)	

The course introduces the fundamental topics of Mobile Computing. In particular, the course will emphasise the network and transport layers of wireless communication protocols and network infrastructure suitable for mobile personal systems (e.g., GSM, 3G, Mobile IP, etc.). Key issues of mobility and disconnected operation with respect to mobile computing systems, and quality of service issues in mobile personal systems will be covered and how applications handle node mobility and wireless communications will be explored.

NWEN 405	**Security Engineering**	15 POINTS **Tri 2**
Coordinator:	Dr Ian Welch	
Prerequisites:	one of NWEN 301, 302, 303 (or COMP 305 or 306 or 310) and one course from COMP 301-388, NWEN 301-399, or SWEN 301-399	
Restrictions:	COMP 418	
Textbook:	Security Engineering, 2nd Edition, Ross Anderson, Wiley, 2008.	

The evidence of how hard it is to build secure systems is all around us in the form of viruses, worms and other problems. This course focuses on techniques for engineering secure systems. In particular we look at experiences from building security at different layers of a system from hardware to networks and approaches to the proper design and validation of these systems. Topics in the course will include: core security concepts, multilateral and multilevel security, network security, distributed application security, security usability, physical security and the economics of security.

NWEN 406	**High Performance Distributed Computing**	15 POINTS **Tri 1**
Coordinator:	Dr Kris Bubendorfer	
Prerequisites:	NWEN 301 or COMP 305 and one of (COMP 306, COMP 310, NWEN 302, or NWEN 303)	
Restrictions:	COMP 415 (2009), ECSE 433 (2009)	

This course focuses on the design and use of distributed systems for high end computing. In particular we look at the aggregation of geographically distributed computing resources to form massive distributed computing platforms. These platforms can then be applied to solve large problems in science and industry – protein docking, seismology, medicine, astronomy, particle physics, climate prediction etc. Topics in this course typically include: e-Science, clusters, grids and clouds, service oriented architectures, workflow management, utility computing and grid economies.

NWEN 438 **Special Topic in Network Engineering 1** 15 POINTS **Tri 1**
Coordinator: To be announced
Prerequisites: Permission of Head of School

A special paper in Network Engineering.

NWEN 439 **Special Topic in Network Engineering 2** 15 POINTS **Tri 2**
Coordinator: To be announced
Prerequisites: Permission of Head of School

A special paper in Network Engineering.

NWEN 440 **Directed Study** 15 POINTS
Coordinator: To be announced
Prerequisites: Permission of the Head of School

Individual programme of study tailored to a particular student. Only offered in special circumstances by negotiation with graduate coordinator and supervisor. May be offered either in Trimester 1 or 2.

SWEN 421 **Formal Software Engineering** 15 POINTS **Tri 1**
Coordinator: A/Prof Lindsay Groves
Prerequisites: SWEN 222, 30pts of COMP 301-399, SWEN 301-399;
Restrictions: COMP 426

This course addresses the use of mathematical logic in the specification and construction for software systems. It presents an introduction to the area of formal methods; the formal specification of software systems; the refinement of specifications to code; and their semantic foundations.

SWEN 422 **Human Computer Interaction** 15 POINTS **Tri 1**
Coordinator: Dr Stuart Marshall
Prerequisites: SWEN 303 (or COMP 311);
Restrictions: COMP 453, ECSE 434

This course covers principles of human-computer interaction that underlie good design of software user interfaces. Advanced topics are introduced with a focus on current research areas.

SWEN 423 **Object Oriented Paradigms** 15 POINTS **Tri 1**
Coordinator: Dr Alex Potanin
Lecturer: Prof James Noble
Prerequisites: 30 pts from COMP 301-399, SWEN 301-399, NWEN 301-399 including SWEN 301 (or COMP 301) or COMP 304;
Textbook: SWEN432 Reader available from Student Notes for $34 (approx).

Object-orientation is the basis for many approaches to programming, systems, languages and applications. This course discusses the design principles of object-orientation and studies advanced topics in system design, programming language, and development process.

SWEN 424 **Model-Driven Development** 15 POINTS **Tri 2**
Coordinator: A/Prof Thomas Kühne
Prerequisites: 30 points from COMP301-399, SWEN 301-399, NWEN 301-399;
Restrictions: COMP 471 (2007-9)

An introduction to model-driven development - the modern approach to large scale software system development along with an introduction to the core concepts of model-driven development, the course will address the foundations and principles for supporting infrastructures. This includes an in-depth discussion of 'metamodeling' and a critique of existing modeling techniques. Students will get hands-on experience with using a meta-case tool.

SWEN 425	**Design Patterns**	15 POINTS	**Tri 2**
Coordinator:	Prof James Noble		
Prerequisites:	30 points from COMP301-399, SWEN 301-399, NWEN 301-399 incliding SWEN 301 (or COMP 301);		
Restrictions:	COMP 463 (2008-9)		

The course addresses a variety of advanced issues in Software Engineering, including the use for Software Patterns for software design.

SWEN 426	**Advanced Software Engineering: Implementation**	15 POINTS	**Tri 2**
Coordinator:	Prof James Noble		
Prerequisites:	30 pts from SWEN 301-399 including SWEN 301 (or COMP 301);		
Restrictions:	COMP 467		

This course begins by covering issues relating to the successful implementation of a software design, including: individual software processes, metrics, the choice of a programming language, the choice of implementation tools, coding styles, code reviews and testing. The course also looks closely at the maintenance stage of software development, and the issue of quality throughout the entire development process. Issues such as software quality assurance, configuration management and software process improvement are raised.

Not offered in 2010.

SWEN 427	**Advanced Software Engineering: Requirements and Design**	15 POINTS	**Tri 2**
Coordinator:	TBC		
Prerequisites:	30 pts from SWEN 301-399 including SWEN 301 (or COMP 301);		
Restrictions:	COMP 466		

The course covers basic concepts and principles of software requirements engineering, its tools and techniques, including a survey of methods for modelling software requirements. The course also covers methods and techniques used in the design of software systems, including both architectural and detailed design. In the requirements and design areas issues such as documentation, reviews and inspections are covered.

Not offered in 2010.

SWEN 430	**Compiler Engineering**	15 POINTS	**Tri 2**
Coordinator:	Dr Alex Potanin		
Prerequisites:	15 pts from COMP 301-399 and a further 15 pts from SWEN 301-399, COMP 301-399;		
Restrictions:	COMP 431		

The course looks at a range of issues relating to the design and implementation of modern compilers. In particular, the course will focus on techniques and algorithms for code generation, code optimisation and type checking. During the course projects, students will be working on a fully-fledged

Java compiler to extend it in various ways. Students should expect to learn a great deal about how compilers work and, in particular, about the Java compiler and Java Bytecode instruction set.

SWEN 431	**Advanced Programming Languages**	15 POINTS	**Tri 2**
Coordinator:	A/Prof Lindsay Groves		
Prerequisites:	30 pts from COMP 301-399, SWEN 301-399 including COMP 304;		
Restrictions:	COMP 432		
Lectures:	Mon Thu Fri 12-1 (EA004)		
Textbook:	Thompson Haskell 2nd edn or any other Haskell book.		

This course develops and extends understanding of the functional programming paradigm, by studying both its theoretical foundations and the practical aspects of programming in a functional language.

SWEN 432	**Advanced Database Design and Implementation**	15 POINTS	**Tri 1**
Coordinator:	Dr Pavle Mogin		
Prerequisites:	30 pts from COMP 301-399, SWEN 301-399, NWEN 301-399 including SWEN 304 (or COMP 302)		
Restrictions:	COMP 442		

This course explores a selection of the following topics: Data Warehouse, Internet and XML Databases, Object-Relational Databases, and Distributed Databases. It examines features of these advanced database systems and analyses the new applications they facilitate.

SWEN 433	**Web Information Systems Engineering**	15 POINTS	**Tri 1**
Coordinator:	Dr Hui Ma		
Prerequisites:	30 pts from COMP 301-399, SWEN 301-399, NWEN 301-399 including SWEN 304 (or COMP 302)		
Restrictions:	COMP 443		

This course gives a technology-centered introduction to web information systems and services. On successful completion of the course students are able to explain basic concepts used in building and managing web information systems. They know central technological standards underlying web information systems and web services, understand architectural principles, and are able to evaluate and critically discuss such systems.

May not be offered in 2010.

SWEN 434	**Data Warehousing**	15 POINTS	**Tri 2**
Coordinator:	Dr Pavle Mogin		
Prerequisites:	30 pts from COMP 301-399, SWEN 301-399, NWEN 301-399 including SWEN 304 (or COMP 302)		

The course considers theory, design and implementation of Data Warehouses.

May not be offered in 2010.

SWEN 438	**Special Topic in Software Engineering 1**	15 POINTS
Prerequisites:	Permission of Head of School	

May not be offered in 2010.

SWEN 439	**Special Topic in Software Engineering 2**	15 POINTS
Prerequisites:	Permission of Head of School	

May not be offered in 2010.

SWEN 440	**Directed Individual Study**	15 POINTS
Prerequisites:	Permission of Head of School	

A supervised programme of study approved by the Head of School. May be offered in Trimester 1 and 2.

SWEN 441	**Directed Individual Study**	15 POINTS
Prerequisites:	Permission of Head of School	

A supervised programme of study approved by the Head of School. May be offered in Trimester 1 and 2.

SCIE 401	CRN 10763	**Special Topic: Directed Individual Study**	15 POINTS
Coordinator:		Dr Marcus Frean	
Prerequisites:		Permission of the Head of School	

Individual programme of study tailored to a particular student. Only offered in special circumstances by negotiation with graduate coordinator and supervisor. Tri 1 or Tri 2.

SCIE 402	CRN 10763	**Special Topic: Directed Individual Study**	30 POINTS
Coordinator:		Dr Marcus Frean	
Prerequisites:		Permission of the Head of School	

Individual programme of study tailored to a particular student. Only offered in special circumstances by negotiation with graduate coordinator and supervisor. Tri 1 or Tri 2.

ECSE 400 and 500 Level Courses
These courses can be taken by MSc, BSc (Hons), PGDipSc, and PGCertSc students.

ECSE 425	CRN 13621	**Advanced Mechatronic Engineering 1: Hardware and Control**	**15 POINTS**	**Tri 1**
Coordinator:		Prof Dale Carnegie		
Lecturers:		Prof Dale Carnegie, tba		
Prerequisites:		PHYS 340 or CSEN 301		
Textbook:		TBA		

Advanced embedded controllers, sensors, actuators, motor drivers, digital control system theory, interfacing and data transmission systems.

ECSE 426	CRN	**Special Topic**	**15 POINTS**	**Tri 1 OR 2**
Prerequisites:		Permission of Head of School		

ECSE 427	CRN	**Special Topic**	**15 POINTS**	**Tri 1 OR 2**
Prerequisites:		Permission of Head of School		

ECSE 430	CRN 13624	**Advanced Mechatronic Engineering 2: Intelligence & Design**	**15 POINTS**	**Tri 2**
Coordinator:		Prof Dale Carnegie		
Lecturers:		Prof Dale Carnegie, Dr Will Browne		
Prerequisites:		PHYS 340 or CSEN 301		
Textbook:		TBA		

Mechatronic design, human-machine interfacing, mechanics, robotic modelling, artificial intelligence, neural networks, genetic algorithms, industrial design, ergonomics.

ECSE 580	CRN 13630	**RESEARCH PREPARATION**	**30 POINTS**	**FY**
Coordinator:		Prof Dale Carnegie		
Lecturers:		Prof Dale Carnegie		
Prerequisites:		90 approved 300 level PHYS or TECH points		
Textbook:		TBA		

An introduction to techniques relevant to research and development work in electronics and computer systems, and the preparation of a research proposal. Techniques include circuit electronic design, layout and construction techniques as well as data acquisition and modelling. The use of software packages such as Protel, LabVIEW and Matlab will form an integrated part of the course.

ECEN 400-Level Courses

BE ECEN 400-level courses can be taken by ME and BSc (Hons), MSc, PGDipSc, PGCertSc, students. Details of 100 to 300-level ECEN courses are in the SECS undergraduate prospectus.

ECEN 403	CRN	**Advanced Electronics**	**15 POINTS**	**Tri 2**
Coordinator:		Dr Robin Dykstra		
Lecturers:		Dr Robin Dykstra, Dr Paul Teal		
Prerequisites:		ECEN303 or ELEN301, ECEN220 or MATH244 or MATH243		
Restriction:		PHYS 423, TECH 423, ECSE423, ELEN401		
Textbook:		TBA		
Assessment:		20% in-trimester assessment, 80% final 3 hour examination		

This course develops further the material of ECEN301 to more sophisticated components, especially those required in radio communications devices. There is a particular emphasis on radio frequency electronics, and solutions to the problems encountered in modelling and design at these frequencies.

ECEN 405	CRN	**Power Electronics**	**15 POINTS**	**Tri 1**
Coordinator:		TBA		
Lecturers:		TBA		
Prerequisites:		ECEN303 or ELEN301		
Restriction:		ELEN402		
Textbook:		TBA		
Assessment:		TBA		

The course covers the theory, design and application of power electronic circuits and the transformation and control of electrical energy.

ECEN 410	CRN	**Advanced Communications Engineering**	**15 POINTS**	**Tri 2**
Coordinator:		Dr Pawel Dmochowski		
Lecturers:		TBA		
Prerequisites:		ECEN310 or CSEN303, ECEN320 or ELEN303		
Restriction:		CSEN403		
Textbook:		TBA		
Assessment:		TBA		

This course covers advanced topics in digital communications, such as multiple antenna systems, multi-carrier communications and Information Theory.

ECEN415	CRN	**Advanced Control Systems Engineering**	**15 POINTS**	**Tri 2**
Coordinator:		Prof Paul Austin		
Lecturers:		Prof Paul Austin, Dr Christopher Hollitt		
Prerequisites:		ECEN315 or ELEN302		
Restriction:		None		
Textbook:		TBA		
Assessment:		50% examination, 20% assignments, 15% in-trimester test, 15% laboratory exercises.		

This course builds on and extends the principles of modern control systems engineering introduced in ECSE 315 to enable students to develop skills in developing mathematical models and in using these to design optimal control systems for real-world multivariable engineering systems. Kalman filters and linear quadratic regulators will be introduced and the principles and benefits of modern model-based predictive control systems will be outlined. Methods will be developed for continuous time system descriptions but techniques for converting to discrete time descriptions and for designing controls for discrete time systems will also be presented. The course will equip students with the ability to design complete control systems that can significantly improve system performance.

ECEN 421	CRN	**Advanced Signal Processing**	**15 POINTS**	**Tri 2**
Coordinator:		Dr Paul Teal		
Lecturers:		Dr Paul Teal, Dr Pawel Dmochowski		
Prerequisites:		ECEN320 or ELEN303		
Restriction:		PHYS 421, TECH 421, ELEN403		
Textbook:		TBA		
Assessment:		20% in-trimester assessment, 80% final 3 hour examination		

The theme of this course is estimation: the information we are interested in is buried somewhere inside a signal, but it is only indirectly related to the signal, and furthermore the signal is contaminated with distortion, noise and interference. We examine algorithms and approaches for optimally extracting the required information.

ECEN 425	CRN	**Advanced Mechatronic Engineering 1: Hardware and Control**	**15 POINTS**	**Tri 1**
Coordinator:		Prof Dale Carnegie		
Lecturers:		Prof Dale Carnegie, tba		
Prerequisites:		ECEN301 or CSEN301		
Restriction:		CSEN401		
Textbook:		TBA		

Advanced microcontroller design and interfacing. Advanced sensing systems and actuator circuits. Mechanics, motors and motor driving circuits, system analysis and digital control theory including PID, state-space, dynamic response, root locus, stability.

ECEN 426	CRN	**Special Topic**	**15 POINTS**	**Tri 1 OR 2**
Prerequisites:		Permission of Head of School		

ECEN 427	CRN	**Special Topic**	**15 POINTS**	**Tri 1 OR 2**
Prerequisites:		Permission of Head of School		

ECEN 430	CRN	**Advanced Mechatronic Engineering 2: Intelligence & Design**	**15 POINTS**	**Tri 2**
Coordinator:		Prof Dale Carnegie		
Lecturers:		Prof Dale Carnegie, Dr Will Browne		
Prerequisites:		ECEN301 or CSEN301		
Restriction:		CSEN402		
Textbook:		TBA		

Advanced mechatronic design methodology, control software, robotic modelling, materials, genetic algorithms, ergonomics and industrial design methodology.

ECEN 440 CRN **Directed Study** **15 POINTS** **Tri 1 OR 2**
Prerequisites: Permission of Head of School

A supervised programme of study approved by the appropriate Head of School.

ECEN 441 CRN **Directed Study** **15 POINTS** **Tri 1 OR 2**
Prerequisites: Permission of Head of School

A supervised programme of study approved by the appropriate Head of School.

Projects

COMP 489 CRN 1027 **Research Project** 30 POINTS **Full Year**
Coordinator: Dr Marcus Frean

A research project on a topic approved by the Head of School.

All candidates for BSc(Hons) in Computer Science are required to take COMP 489, which is a research project conducted under the supervision of a staff member. The purpose of the BSc(Hons) research project is to provide students with an opportunity to study a particular problem within this area. It is also intended to provide training and experience in individual study and research, and communicating the results thereof. COMP 489 is a two-trimester course. It can be done over any two consecutive trimesters.

COMP 588 CRN 8245 **Project** 30 POINTS **Full Year**
Coordinator: Dr Marcus Frean

All candidates for MCompSc are required to take COMP 588, which is a project conducted under the supervision of a staff member. COMP 588 is a two-trimester course. It can be done over any two consecutive trimesters.

ECSE 489 CRN 13629 **Research Project** **30 POINTS** **Full Year or Tri 1**
Coordinator: Dr Marcus Frean

A research project on a topic approved by the Head of School.

All candidates for BSc(Hons) in Electronic and Computer System Engineering are required to take ECSE 489, which is a research project conducted under the supervision of a staff member. The purpose of the BSc(Hons) research project is to provide students with an opportunity to study a particular problem within this area. It is also intended to provide training and experience in individual study and research, and communicating the results thereof. ECSE 489 is a 30pt course and can be done either over trimesters 1 and 2, or in the first trimester.

ENGR 489 CRN **Project** 30 POINTS **Full Year**
Coordinator: Dr Marcus Frean

A project on a topic approved by the Head of School.

All candidates for the BE are required to take ENGR 489, which is a project conducted under the supervision of a staff member. ENGR 489 is a two-trimester course.

COMPUTER SCIENCE (COMP/NWEN/SWEN) 300-LEVEL COURSES

These courses can be taken by students who are doing a degree in BSc (Hons) and MSc in Computer Science or MCompSc. Details of 100- and 200-level courses are in the Computer Science undergraduate prospectus.

COMP 303 CRN **Design and Analysis of Algorithms** 15 POINTS **Tri 2**
Coordinator: Dr Alex Potanin
Prerequisites: COMP 261 or SWEN 221 or NWEN 241 (or COMP 205 or ENGR 202), SWEN 224 (or SWEN 202 or COMP 202), MATH 261 (or MATH 214);

This course examines techniques for developing correct and efficient algorithms to solve some important classes of problems in Computer Science. It explores various methods for designing algorithms, including greedy algorithms, divide and conquer, dynamic programming and graph algorithms. It covers techniques for demonstrating the correctness of algorithms and for analysing their efficiency.

COMP 304 CRN 964 **Programming Languages** 15 POINTS **Tri 1**
Coordinator: A/Prof Thomas Kühne
Prerequisites: COMP 261 or SWEN 221 or NWEN 241 (or one of COMP 205, 206, ENGR 202, SWEN 201), SWEN 224 (or SWEN 202 or COMP 202), MATH 161 (or MATH 114);

This course addresses the principles of programming language design and use. It introduces different models of computation and the programming languages based on them, particularly functional programming and logic programming. It then examines a range of underlying issues in programming languages, such as semantics of programming languages, type systems, and control in programming languages.

COMP 307 CRN 968 **Introduction to Artificial Intelligence** 15 POINTS **Tri 1**
Coordinator: Dr Xiaoying Sharon Gao
Prerequisites: COMP 261 or SWEN 221 or NWEN 241 (or one of COMP 205, 206, ENGR 202, SWEN 201)l; MATH 161 or 151 (or 114);

This course considers ideas and techniques from Artificial Intelligence. It first introduces a range of search algorithms that are used throughout AI. It then examines applications and techniques of AI, including rule-based systems for embodying human expertise, algorithms for planning and problem solving, natural language processing, methods for machine learning, and neural nets and other computation intelligence techniques.

COMP 312 CRN 10444 **Simulation and Stochastic Models** 15 POINTS **Tri 2**
Coordinator: Dr Stefanka Chukova

Prerequisites: COMP 261 or SWEN 221 or NWEN 241 (or one of COMP 205, 206, ENGR 202, SWEN 201)l; MATH 161 or 151 (or 114); STAT 131 (or comparable background);
Restrictions: OPRE 352

An introduction to computer simulation and queues using stochastic models.

COMP 348 CRN Special Topic: Computer Game Development 15 POINTS **Tri 1**
Coordinator: Dr Peter Andreae
Prerequisites: 40 points from COMP 205, 206, 202, ENGR 202, SWEN 201, SWEN202; permission of HoS.

A practical exploration of Computer Game Development involving cross-disciplinary teams from both Computer Science and Digital Design. The course will investigate tools, techniques and concepts for building interactive computer games, including software engineering techniques, HCI principles, AI methods, and design strategies. The course will be co-taught with DESN385 and will involve a substantial group project in which each team will consist of students from both courses. COMP 348 will focus on the programming and technical aspects of game development (and will be assessed separately from DESN 385), but interacting with team members from the other discipline and appreciating the complementary aspects of game development, which reflects the industry standard for creating new titles for console, portable and PC-based games, will be important for students in both courses.

ENGR 301 CRN 17178 **Project Management** 15 POINTS **Tri 1**
Coordinator: Dr George Allan
Prerequisites: Admission to Part 2 of the BE;
Restrictions: BITT301

Project management including aspects of life cycle, requirements analysis, principles of design, project tasks and deliverables, contracts, feasibility analysis, cost estimation and cost/benefit analysis, project scheduling, critical path analysis, risk management, quality assurance, managing project resources, testing and delivery, maintenance, interpersonal communication, teamwork and project leadership.

ENGR 302 CRN 17179 **Group Project** 15 POINTS **Tri 2**
Coordinator: Dr George Allan
Prerequisites: ENGR 301;

Students will work in teams on a project of modest complexity, practising teamwork, project planning, the development of interface specifications and testing.

project leadership.

NWEN 301 CRN 17180 **Operating System Design** 15 POINTS **Tri 1**
Coordinator: Dr Kris Bubendorfer
Prerequisites: NWEN 241 (or COMP 206 or SWEN 201); NWEN 242 (or NWEN 201 or COMP 203); MATH 161 (or MATH 141);
Restrictions: COMP 305

This course addresses the design and implementation of operating sytems, and examines fundamental concepts such as resource management, concurrency, protection and security. Examples drawn from a range of modern operating systems illustrate these concepts and project work provides practical experience in the design and implementation of operating systems.

NWEN 302 CRN 17181 **Computer Network Design** 15 POINTS **Tri 2**

Coordinator: Dr Kris Bubendorfer
Prerequisites: NWEN 241 (or COMP 206 or SWEN 201); MATH 161 (or MATH 114);
Restrictions: COMP 306

This course addresses the principles, architectures and protocols that have shaped the development of the Internet and modern networked applications. It examines network design principles, underlying protocols, technologies and architectures such as naming, data transport, routing, wireless communication and multimedia. The course introduces algorithms for networked applications including messaging, encryption and authentication.

NWEN 303 CRN 17182 **Concurrent Programming** 15 POINTS **Tri 1**

Coordinator: Dr Ian Welch
Prerequisites: COMP 261 or NWEN 241 or SWEN 211 (or COMP 206 or SWEN 201); NWEN 242 (or NWEN 201 or COMP 203); MATH 161 (or MATH 114);
Restrictions: COMP 310

This course examines a range of techniques for programming multi-threaded and distributed applications. Topics include synchronisation mechanisms used for programs that communicate via shared memory and message passing techniques for programs that communicate across a network. Practical work involves implementing programs using these techniques in a modern concurrent language, such as Java.

SWEN 301 CRN 17183 **Structured Methods** 15 POINTS **Tri 1**

Coordinator: Dr Hui Ma
Prerequisites: SWEN 222 (or COMP 205 or ENGR 202); SWEN 223 (or 203);
Restrictions: COMP 301

This course introduces structured methods, tools and procedures for software engineering. These include the software life-cycle, common software engineering paradigms, and key elements of software engineering such as requirements analysis and specification, design, implementation, testing, maintenance, software quality assurance and software configuration management. Practical work includes the use of an integrated computer aided software engineering (CASE) environment and other development tools.

SWEN 302 **Agile Methods** 15 POINTS **Tri 2**

Coordinator: Dr Stuart Marshall
Prerequisites: SWEN 222 (or COMP 205 or ENGR 202)

This course introduces agile methods for software engineering, including continuous deployment, in-use acceptance testing, refactoring, unit testing, hacking, incremental design, retrospective analysis, iterative planning and lean engineering management.

SWEN 303 **User Interface Design** 15 POINTS **Tri 2**

Coordinator: Dr Stuart Marshall
Prerequisites: SWEN 221 or COMP 261 (or COMP 205 or ENGR 202);
Restrictions: COMP 311

This course addresses the design and engineering of user interfaces. It presents principles and guidelines for design and covers a range of design processes. It presents techniques for testing user interfaces, and considers a variety of user interface styles and interface devices.

SWEN 304 **Database System Engineering** 15 POINTS **Tri 2**

Coordinator: Dr Pavle Mogin
Prerequisites: COMP 261 (or 206 or SWEN 201); MATH 161 (or 114);
Restrictions: COMP 302

The course presents an introduction to database system engineering and management. Topics include the design and optimisation of database engines, database design, database modelling, query languages, data warehousing, Internet and XML databases, object-relational databases, deductive databases, and distributed databases.

STAFF RESEARCH PROFILES

George Allan *BSc (Reading); MA(Ed) (Portsmouth); PhD (Portsmouth), Senior Lecturer*

George Allan is a postmodernist grounded theorist who is currently researching the epistemology of computer-based projects, in particular the ways in which people build their knowledge of how IS/IT projects should be managed to maximize success and minimize the risks of failure. One area of research is into the use of Risk Management paradigms in system development and system maintenance. Another area is into awareness as a Critical Success Factor (CSF) in the professional practices of IS/IT/ICT Project Managers. George Allan has recently arrived here from the UK where he held many research grants from industry and government. Another area of this investigation into the epistemology of project management is how our University students build their knowledge, how they learn from their lectures and academic experiences.

Peter Andreae *BE (Hons) (Cant); MS, PhD (MIT), Senior Lecturer*

Peter's research interests lie in the areas of machine learning and program construction tools. He is particularly interested in the area of reinforcement learning – how an agent acting within some world can learn to do actions that achieve reward or generate interesting behaviour. He is exploring the use if non-standard reward mechanisms and agents in worlds containing complex objects. His other research projects involve developing a programming environment that enables users to construct programs by demonstration and developing algorithms for clustering large collections of data.

Will Browne *BEng (Bath, UK), MSc (Cardiff, UK), EngD (Cardiff, UK), Senior Lecturer*

Will's main area of research is Applied Cognitive Systems, essentially, how to use inspiration from natural intelligence to enable computers/machines/robots to behave usefully. This includes: Cognitive Robotics, Learning Classifier Systems (a branch of evolutionary computation) and Modern Heuristics for industrial application. Blue skies research includes analogues of emotions, abstraction, memory systems, 'small worlds' phenomenon, confusion/dissonance and machine consciousness.

Kris Bubendorfer *BSc, MSc(Hons), PhD (VUW), Senior Lecturer*

Kris is enthusiastic about mobility, both in terms of providing supporting architectures and as a programming paradigm. His particular focus is in globally distributed systems, in which both clients and applications experience high degrees of mobility. This is reflected in the Nomad architecture, which is a globally distributed middleware environment, that enables mobile applications to locate and negotiate (bargain) for remote execution resources. The Nomad project, developed with John Hine, also includes active research into issues of location, policy, autonomous management, cooperation, policing and security.

Nicholas Cameron *BSc (UCL), PhD (Imp), Postdoctoral Fellow*

Nicholas's research interests are in type systems and programming language design and theory. He has spent time investigating the safety and type theory of Java and designing new language features which accurately and intuitively describe program behaviour. He is currently focusing on investigating the foundational theory and implementation of proposed language extensions for object ownership.

The underlying thread of his research is finding ways in which exotic, but well understood, theoretical constructs (dependent types, phantom types, path types, existential polymorphism, virtual classes, effect systems, invariants) can be exported to real-life object-oriented programming languages.

Dale Carnegie *MSc PhD (Waikato), Professor*

Dale heads Victoria's Mechatronics and Robotics Research Group. This Group has constructed New Zealand's most diverse collection of mobile autonomous robots, including MARVIN (Mobile Autonomous Robot for Indoor Navigation). MARVIN can wander office corridors after hours, question people he meets, change his shape to become larger and more intimidating, and alert security guards if required.

MARVIN is an example of the growing field of "mechatronics" which combines mechanical, electronic and software engineering with sensors, physics, mathematics, marketing and design. One of the new developments of the Group is a system of robots designed to find people trapped under building rubble caused by earthquakes or terrorist activity. Comprising a hierarchy of different sized and shaped robots, this system is a world first with the potential to save thousands of lives.

Pawel Dmochowski, *PhD (Queen's Canada), Lecturer*

Pawel's research interests lie in the areas of wireless communications and signal processing, more specifically focusing on timing synchronization, multiple-antenna techniques, Cognitive Radio. Recent projects include the development and analysis of low complexity symbol timing synchronization framework for Multiple-Input Multiple-Output (MIMO) systems. In the realm of Cognitive Radio, the focus has been on the characterization of interference caused by unlicensed users, with the aim of developing effective mitigation strategies. Other projects include virtual/networked MIMO and green communications.

Robin Dykstra*, PhD (Massey), Senior Lecturer*

Robin's interest is the development of scientific, industrial and educational instruments. Some examples are: (a) Portable NMR spectrometers using Radio Frequency (RF), digital transceiver, Digital Signal Processing (DSP) and power electronics technologies. (b) Earth's field NMR systems for education and for the study of the microstructure of Antarctic sea ice. (c) High performance motor controllers and drive systems for Rheo-NMR. With many of his projects, Robin takes them to the complete product level and are commercialised through Magritek Ltd.

Marcus Frean *BSc(Hons) (Massey); PhD (Edinburgh), Senior Lecturer*

Marcus studies machine learning, and in particular combinations of neural networks and probabilistic inference that are inspired by the way we think embodied brains might work. He is interested in how machines can learn useful representations of the world, how they use those representations to drive coherent actions, and what this might tell us about how biological creatures carry out cognition. A parallel interest is theoretical evolutionary biology and complex adaptive systems. Marcus's research has looked at the evolution of cooperation, the counter-intuitive effects that spatial structure can have on population dynamics, and ways in which network structure affects the rate of evolution.

Qiang Fu *BE (Harbin), MEngSc (Adelaide), MBA (QUT), PhD (UQ), Lecturer*

Qiang's research interests are in the areas of wireless and mobile networking protocols, integration and interworking of wired and wireless networks, network measurement and traffic analysis, Internet protocols and systems, and network security. Prior to his academic career, he had worked in mobile communications and aerospace industries for a number of years. Qiang is particularly interested in realistic network modelling and improving the performance of networking protocols based on "real world" scenarios.

Xiaoying (Sharon) Gao *BE, ME (Hebei); PhD (Melbourne), Senior Lecturer*

Xiaoying's main research interests are in the area of information extraction, knowledge based systems, and machine learning. Her research focuses on using knowledge engineering and machine learning technology to develop information agents–-intelligent programs that automatically search and extract information from the World Wide Web. She is currently working on algorithms for learning information extraction patterns from semi-structured Web pages.

Gideon Gouws*, PhD (Port Eliz), Senior Lecturer*

Gideon's research interest is focussed on the development of sensors or sensor system for a variety of applications. Over the past few years he has studied various aspects of ultrasonic sensors, particularly shear mode (TSM) quartz resonators, for application as materials sensors. The use of different measurement configurations, together with signal processing techniques have shown that these sensors can successfully be used as sensors of material characteristics in the vapour, liquid or solid phase. Work is currently also being done in conjunction with Industrial Research Limited on ultrasonic sensors for non destructive testing of materials. Work is also in progress on the development of passive (non-powered) sensors using magnetoelastic materials.

Lindsay Groves *BSc (Auck); MSc(Hons) (Massey); PhD (VUW), Associate Professor*

Lindsay's main research interests are in formal methods (essentially, the use of mathematical/logical notation and reasoning) for software specification and design. The main focus of this work is the development of techniques for deriving programs from formal specifications based on the refinement calculus, and the design of tools to support program refinement, but also includes application of formal methods in industrial applications, refinement of logic programs, verification of concurrent systems, and semantics of data models. Lindsay is involved in three externally funded projects: investigating industrial applications of formal specification techniques (jointly with Ray Nickson and Waikato University, funded by FRST); proof methodologies for concurrent algorithms (jointly with Ray Nickson and Sun Microsystems, Boston, funded by Sun); and mathematical foundations for semistructured data (jointly with Auckland University, funded by the Marsden Fund). He also has more general interests in software engineering, including program visualisation, program understanding, program maintenance/evolution and safety-critical systems.

John Hine *BSEE (Union); MSc, PhD (Wisc), Professor*

John's research interests are in large scale distributed systems. The exponential growth in the capability of our networks and computer systems is enabling the development of new applications such as grid computing and interactive collaboration. These applications share many common problems that are addressed in a software layer called middleware. John's current work focuses on middleware and includes the use of events as a new communication paradigm, role based access control and naming and location of services. His research anticipates a new paradigm for distributed computing in which mobile components locate and purchase resources as they move through a network.

***Christopher Hollitt**, BE(Elec)(Hons), BSc(Hons), PhD (Adelaide), Lecturer*

Christopher's research focuses on the practical application of control engineering and of signal processing techniques. In particular, he is using these techniques to develop a low level robot brain, capable of perceiving and interpreting the world and controlling the robot's actions. A range of reflexes intended to protect the robot and ensure its effectiveness are being developed, as well as a set of fundamental physical actions that can be used as the basis of more intelligent behaviours.

***Peter Komisarczuk** BSc(Hons), MSc (Nottingham); PhD (Surrey) Senior Lecturer*

Peter's primary research area is in communication systems. He has worked in the telecommunications industry for almost 20 years in roles from R&D to business development, covering many broadband and transport network technologies, the Internet and distributed systems/network management. He is a chartered engineer and is active in New Zealand professionally as a member of the NZCS, IET and IEEE and in liaison with industry.

Current research areas are Internet security in collaboration with Dr Ian Welch, cognitive radio in collaboration with Dr Paul Teal and Dr Pawel Dmochowski and Grid computing with Dr Kris Bubendorfer. He has published in the areas of telecommunications, broadband networking, Next Generation Networks and Grid computing and he is a member of the Distributed Systems Research Group (DSRG) and the Communication Systems Research Group (CSRG). In Grid Enabled Internet Instruments (GEII) we look at the synergy between Grid computing and network monitoring and scanning instruments such as network telescopes for Internet Background Radiation (IBR) and client honeypots for malicious web server detection and exploit identification. Deploying these instruments in a worldwide grid creates a global instrument that collaboratively can be used to map exploits and create quality measures for the Internet. For example our client honeypot technology called Capture-HPC is a world class client honeypot system, which is widely used. In our cognitive radio work we apply cognition algorithms, such as reinforcement learning to the allocation of wireless resources, such as channel selection. These mechanisms allow us to choose optimal actions in wireless systems to optimise quality of service and end-to-end transmission.

***Thomas Kühne** MSc, PhD (TUD), Associate Professor*

Thomas' research interests include object-technology, programming languages, component architectures, (meta-)modeling, and model-driven development. He is interested in constructive software engineering – how can one produce systems with built-in quality that need not be checked by analytical methods afterwards? In particular, he is interested in the creation of software systems from high-level descriptions by a series of transformation steps to low-level executable code. Furthermore, he has an interest in multi-level description hierarchies for both modelling and programming.

***Wei Li** BE (BUPT), ME (BUPT), PhD (UVic, Canada), Senior Lecturer*

Wei's research interests are in information theory and contemporary wireless systems. His current research areas are: novel modulation and diversity schemes for high speed wireless transmission; UWB channel modelling, signal detection and networking; locating and tracking based on wireless sensor networks; network self-optimization and heterogeneous networks. He is also interested in practical topics such as cross layer design for connection aware applications; service oriented baseband design for RFID; and standardization of telecommunication technologies.

***Andy Linton** BEd(Newcastle-upon-Tyne), MSc(Newcastle-upon-Tyne), Teaching Fellow*

Andy has worked in computer networking for over 25 years. He has worked at universities and

Internet Service Providers in New Zealand, Australia and England designing and engineering large reliable computer network systems. His primary interests in this area are the management and monitoring of router and server systems.

He is heavily involved in internet governance locally and internationally and has served on the board of Public Interest Registry which manages the .org domain and on the council of InternetNZ. He is currently a Director of the .nz Domain Name Commission that manages and sets the policies for the .nz namespace and a trustee of the NZNOG Trust that oversees the NZ Network Operators' Group annual meeting. He is an active participant in the Asia Pacific Network Information Centre's (APNIC) Policy group.

Hui Ma *BE (Tongji), MSc (Massey), PhD (Massey), Lecturer*

Hui Ma obtained a PhD in Information Systems from Massey University in 2008. Before joining the School of Mathematics, Statistics, and Computer Science at Victoria University in 2008, she worked as an Assistant Lecturer at the Department of Information System at Massey University and has been a member of the Information Science Research Centre since 2003.

Hui's research areas are databases and software engineering. She has a particular interested in distributed databases, database programming, database design quality, web information systems, XML, cloud computing, service computing. Hui is also involved in international collaborations on service-oriented modelling and XML data modelling.

Petra Malik *PhD (Kaiserslautern), Lecturer*

Petra's research interests lie in the area of formal methods, especially in formal software specification, verification, and synthesis techniques. She has worked on tool support for the specification language Z and on developing incremental model checking algorithms for discrete event systems. Recently she has become especially interested in refinement, theorem proving, verification of concurrent systems, and Alloy.

Stuart Marshall *BSc (Hons) PhD (VUW), Lecturer*

Stuart is currently working in the fields of user interface modeling, agile development and software preservation. Stuart is particularly interested in techniques to create new (or annotate existing) user interface models informed by data on how users actually use their software. Stuart is also involved in investigating various features of agile development with respect to project management, and in how old software games from the 1970s/80s can be preserved for future generations. Stuart's Masters and PhD theses were in the field of software reuse, and he is still interested in how developers can better evaluate candidate reusable components.

Pavle Mogin *BEng (Hons) (Belgrade), PhD (Nis), Senior Lecturer*

Pavle's research interests cover two areas of databases. Within the area of Object-Relational Databases, he is particularly interested in: introduction of new database constraints - their formal description, and development of algorithms for their enforcement, introducing the formal (mathematical) foundation developed for the design of relational databases into the design of object-relational databases, Database schema integration, and Query Optimization and use of Materialized Views in Data Warehousing. Within the area of XML Databases, his interests include: mapping XML DTDs or XML schemas to Object-Relational schemas, mapping Object-Relational schemas to XML DTDs or XML schemas, publishing object-relational data as XML documents, and normal forms and normalization algorithms for XML schemas.

James Noble *BSc(Hons), PhD (VUW), Professor*

James's research centres around software design. This includes the design of the users' interface,

the parts of software that users have to deal with every day, and the programmers' interface, the internal structures and organisations of software that programmers see only when they are designing, building, or modifying software. His research in both of these areas is coloured by his longstanding interest in object oriented approaches to design. Within software design, his interests are rather broad. His current projects include: aliasing in object-oriented systems, design patterns, usage-centred interface design, global component migration, and program visualisation.

David Pearce *MEng (Hons)(London) PhD (Imp) , Senior Lecturer*

David's research interests include directed graph algorithms and program analysis. In particular, he is interested in developing efficient new algorithms for improving the execution time and precision of pointer analysis. Here, pointer analysis is the problem of tracking how pointer values flow within a program. This can be used, for example, to automatically detect NULL pointer dereferences. To this end, David is currently investigating new algorithms for dynamic topological sort, transitive reduction, transitive closure and incremental static single assignment form.

Alex Potanin *BSc (Hons) PhD (VUW), Lecturer*

Alex's research interests lie in the intersection of Programming Languages and Software Engineering. He is interested in ownership and other ways of dealing with aliasing in object-oriented programming languages. He is also a big fan of Java Generics and how it can be utilised to provide frequently requested features like object immutability, alias protection and much more. Finally, if the formal side (type systems) of these solutions can be accompanied by design patterns demonstrating the usefulness of such features, it will make his day.

Winston Khoon Guan Seah *BSc, MEng (NUS); DEng (Kyoto), Professor*

Winston is actively involved in research and development in the areas of mobile ad hoc and sensor networks, and co-developed one of the first Quality of Service models for mobile ad hoc networks. He has worked for more than 15 years in mission-oriented research, taking ideas from theory to prototypes. His latest research focuses on wireless sensor networks (WSNs) powered by ambient energy harvesting, WSNs for structural health monitoring, and mobility-enhanced protocols and algorithms for networked swarm robotics and sensing applications in terrestrial and oceanographic networks. He is also interested in environmentally-friendly (green) technology for wireless systems.

Projects:

- Wireless Sensor Networks Powered by Ambient Energy Harvesting (WSN-HEAP)
- Robust end-to-end wireless multihop protocols for harsh environments
- Environmentally-friendly (green) protocols for wireless communications systems
- Networking protocols for swarms of unmanned air/ground/underwater vehicles
- Game-/queueing-theoretic approaches in wireless communications systems
- Cognitive approaches for wireless sensor-actuator networks

Mansoor Shafi *BSc (Lahor), PhD (Auck), Adjunct Professor*

Mansoor's research interests are in the physical layer of Communications Systems- specifically in the following areas: Radio Propagation Models; information theoretic and practical aspects of MIMO Systems; Intelligent receiver architectures, adaptive antennas, diversity techniques; Broadband Wireless communications systems; Modulation, channel estimation and equalization; and Cognitive Radio.

Paul Teal *BE(Hons) PhD, Senior Lecturer*

Paul's areas of research are in the development of algorithms and techniques of signal processing, and the application of these techniques in audio, communications and biomedical devices. Signal

processing is vital to the economy, because it underpins almost all other scientific and technological endeavour. Most scientific experiments, for example, involve collection of data by some sort of electronic device. Interpretation of this data will involve some sort of signal processing, and superior techniques will result in superior data interpretation.

Ian Welch *BCA (VUW), MSc (Newcastle upon Tyne, UK), PhD (Newcastle upon Tyne, UK) Senior Lecturer*

Ian studied commercial law and accountancy at Victoria University before working for Andersen Consulting on the redesign of the Inland Revenue tax system. Subsequently he obtained a Masters and PhD from the University of Newcastle upon Tyne. While at Newcastle he was involved in three EU projects: Design for Validation; Dependable Systems of Systems; and, Malicious- and Fault-Tolerant Internet Applications. His PhD is in the area of software engineering and application-level security. He has been working at Victoria since 2003 in the Distributed Systems Research Group although he also does work with colleagues from the ELVIS Software Research Group.

Ian supervises projects on Internet Security (searching the web for malware and measuring the amount of malicious activity on the Internet), anonymous and verifiable auctions (removing the need for a centrally trusted auctioneer) and Grid-enabled Internet Instruments (managing network instruments using workflows). He is also involved with a project to preserve New Zealand's early computer gaming software.

Mengjie Zhang *BE, ME (HebeiAgr); PhD (RMIT) Associate Professor*

Mengjie's main research interests include Evolutionary Computing (Genetic Programming, Particle Swarm Optimisation, and Evolutionary Multi-objective Optimisation), data mining and machine learning, and intelligent and evolutionary computer vision, image analysis and processing. He currently holds a number of funded projects, including a Marsden grant on genetic programming for classification, a URF grant on particle swarm optimisation for image recognition, and a BuildIT funded project on genetic programming and evolutionary computing techniques. He also has a number of other projects including evolutionary art/design and engineering applications. He is also interested in learning theory and Web intelligence.

GENERAL INFORMATION

Classes of Degree

Honours degrees are awarded with first, upper second, lower second, or third class honours. Lecturers may assign provisional grades for individual pieces of work during the year. In addition to posting a final class of honours at the end of the year, letter grades (A+, A, A-, B+, B, B-, C+, C, D, E) will be posted for particular courses. “A” grades correspond to first class work; “B+” and higher “B” to upper second class work; lower “B” and “B-“ to lower second class work; and “C” to third class work.

Candidates should be aware that the award of a class honours is based upon overall assessment of the calibre of work done across all the courses taken. The final assessment is arrived at by the School in consultation with external examiners.

Those who take MSc Parts 1 and 2 will receive a class of Honours. Candidates taking MSc Part 2 only (thesis) may be eligible for Distinction or Merit (see VUW *Calendar*, Personal Courses of Study Statute Part 2).

Examinations and Assessment

Please note that students enrolled in courses that have a final examination are expected to be available in the relevant examination period. In 2010 these are: **11 June – 30 June and 22 October – 13 November**. Exam timetables are normally published after the mid-term break.

Postgraduate Research Supervision

Faculty of Graduate Research, Faculty of Science and Faculty of Engineering require all supervisors to provide 6-monthly written reports on students enrolled in Masters by thesis and PhD courses. These reports are expected to identify what has been achieved, outline agreed timetables for future work and identify any problems with a student’s performance that require to be rectified. Copies of the formal written reports are provided to the student, the School’s postgraduate thesis coordinator and relevant Student Administration Advisers.

Theses are prepared and written in close consultation with a staff member who acts as supervisor. Research students are expected to participate in and contribute to research-in-progress seminars organised from time to time by the School.

Student Employment

Each year a number of students are employed as part-time tutors for 100 through 300-level courses in Computer Science. Preference is given to graduate students. Further information may be obtained from the School Office.

Part-time assistants may also be employed on research and consulting projects.

Funding

The Research Funding Guide is published by the University’s Research Office and can be downloaded from **https://intranet.victoria.ac.nz/research-office/index.aspx**

The Postgraduate Students Association (**http://www.victoria.ac.nz/pgsa/**) has information on StudyLink funding. Faculty Research Grants may also be available, contact Keith Willett, Faculties of Science and Engineering, tel 04-463 5508, keith.willett@vuw.ac.nz, for information.

Postgraduate Scholarships

Students should check out the University’s Prizes and Scholarships database, accessible via: **www.victoria.ac.nz/scholarships**

The Victoria Graduate Awards are open to students taking Honours or Masters (Part 1), and provide a waiver of tuition fees. Victoria Master's (by thesis) Scholarships are open to students taking a master's thesis with 90 points or above (MSc Part 2, ME). Applications for these awards for 2010 close on 1 November 2009. Application forms can be downloaded from the Scholarships website:

www.victoria.ac.nz/scholarships

PhD students: The admission and scholarship application methods for prospective PhD students will be changed from 2010. The admission application and scholarship application for PhD students until 2010 were two separate processes. From 1 January 2010, the two separate processes will be merged to a single process: the prospective PhD students can indicate on their admission application whether they want to apply for a scholarship from the university or not. From 2010 there will be three deadlines for all PhD applications to be considered. The proposed dates are 1 March, 1 July and 1 November. More information can be seen from the FGR web site:

http://www.victoria.ac.nz/phd

Official School Communications

Official notices of the School are posted on noticeboards in level 2 corridors of the Cotton building. Each course will have a specific web presence which may be used for advising of announcements, check http://ecs.vuw.ac.nz/courses/ for a list of all the courses offered by the School. You may also be communicated with via your ECS e-mail account or via a course specific forum.

Social and Cultural Activities

VEC - Vic Engineering Club. http://www.vec.org.nz/
Interface – The VUW Computer Club. http://www.interface.org.nz/

School-Provided Facilities

- Office facilities (e.g., room, furniture, fax, phone, photocopier),
- computing facilities (PC, software, internet/e-mail access, MSCS services),
- printing facilities,
- tea/coffee facilities, kitchen facilities and common room availability

Postgraduate Students Association

Room 202, 20 Kelburn Parade, Mon, Wed, Thurs 10am-1pm
Tel 0-4-463 6973, email pgsa-ea@vuw.ac.nz, www.victoria.ac.nz/pgsa
The Victoria Postgraduate Students' Association (PGSA) is recognised by VUWSA as the representative body for all postgraduate students at Victoria University. The PGSA provides representation and other services for all Victoria's approximately 3,500 postgraduate students. Services include advice, advocacy for individuals and groups of postgraduate students, lobbying on issues important to you, representation on a variety of university committees, social activities, seminars, training workshops and information.

In addition the PGSA organises Victoria's teaching awards (*the Victorias*), and publishes a postgraduate journal *Third Degree*. The Association is always eager for postgraduates to get involved, and there are always things for people to do!

Subscribe to the PGSA email list by emailing pgsa-members-subscribe@vuw.ac.nz

Te R•pu •whina P•taiao
Awhina is the comprehensive whanau mentoring programme for Maori and Pacific Nations Science, Architecture, Design and Engineering students enrolled in 100- and 200-level courses. Awhina also supports non Maori and Pacific Nations students who wish to be included. Graduate and postgraduate Maori and Pacific Nations students (and other interested students) are encouraged to become involved as mentors to these students and help them get their university studies off to a good start. If you are interested in becoming a mentor please contact Liz Richardson, Deputy Dean (Equity) for the Faculties of Science, Architecture & Design and Engineering (463 5748, liz.richardson@vuw.ac.nz). For further information check the Science Faculty website: www.victoria.ac.nz/science/Awhina

Student Services Group
Student Services provides a range of services to ALL students to help you make the most of your time at university. Contact the following services for assistance directly or visit the website **www.victoria.ac.nz/st_services/** to find out more. Many of these services are available at all campuses – the location details of the services on the Kelburn campus are listed here and the main phone number. Make contact to choose which available location best suits you.

Accommodation Service

14 Kelburn Parade
Phone: 04-463 5896
Email: accommodation@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/accommodation**

If you need a flat, flatmates or Hall of Residence information, the Accommodation Service is a great place to start. The website has an online letting service with a range of vacancy listings to suit all budgets and tastes and staff are happy to advise you on tenancy issues.

Career Development and Employment (Vic Careers)

14 Kelburn Parade
Phone: 04-463 5393
Email: careers-service@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/careers**

Contact Vic Careers if you need some independent career advice to help you find the right career, to find out what sorts of careers are available with your degree or to get some help in writing a CV. If you are looking for a job watch out for Graduate Recruitment programmes and check-out Victoria CareerHub (**careerhub.victoria.ac.nz**) your 24/7 jobs online service – logon using your ITS account.

Counselling Service

2 Wai-te-ata Road
Phone: 04-463 5310
Email: counselling-service@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/counselling**

Counsellors are available to discuss personal and academic issues that affect your general sense of wellbeing, your relationships or your learning. Ring to make an appointment for this free, confidential service.

Crèches and ECEs

Phone: 04-463 5151

Email: childcare@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/creches**

The University crèches can provide your child/children with the best possible education and care while you study. The Student Crèche has three centres on Kelburn Campus and one at the Law School, Pipitea Campus.

Disability Services

Level 1, Robert Stout Building
Phone: 04-463 6070
Email: disability@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/disability**

At Victoria, disability is self-defined and includes people with permanent, temporary or recurring impairments, injuries or chronic medical conditions. Contact DSS's Student Advisers to confidentially discuss your individual needs.

Financial Support and Advice

14 Kelburn Parade
Phone: 04-463 6644 for information, 04-463 7474 for an appointment
Email: student-hardship@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/finadvice**

Finance Advisers can provide you with practical advice on budgeting and coping financially, help you with Student Loan and Allowance applications and the preparation of financial statements for Scholarship applications. Through the Hardship Fund they are also able to provide emergency financial assistance if you are facing hardship.

Health Service

4 Wai-te-ata Road
Phone: 04-463 5308 or 04-463 7474
Email: student-health@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/health**

The Health Service offers you a general practice medical service on campus which is free or very low cost for most students. It deals with illnesses, accidents and prescriptions, and offers specialist services such as psychiatry, nutrition, dermatology and physiotherapy.

Kaiwawao Mäori / Mäori Student Services Adviser

Level 0, Kirk Wing, Hunter Courtyard
Phone: 04-463 6001
Email: kaiwawao-maori@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/kaiwawao**

The Kaiwawao Mäori's main objective is to encourage and assist students to participate and succeed by providing support to all students of Mäori descent. If you have questions, concerns or are unsure about whom to talk with / where to go, the Kaiwawao Mäori can help.

Manaaki Pihipihinga Programme

Room 109, 14 Kelburn Parade
Phone: 04-463 6015

Email: manaaki-pihipihinga-programme@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/mentoring**

This mentoring programme is for all Mäori and Pacific Nations students in the Faculties of Commerce and Administration, and Humanities and Social Sciences. Mentors are successful senior students who can assist you with course-related tasks.

Pacific Support Coordinator

Fa'afo'i Seiuli
Room 109b, 14 Kelburn Parade
Phone: 04-463 5842 or 027-563 5842
Email: faafoi.seiuli@vuw.ac.nz

The Pacific Support Coordinator assists with the transition of Pacific students into university life as well as helping them cope with academic studies – by making appointments with services on a student's behalf, taking students to services that will help and by providing information on scholarships.

Student Learning Support Service (SLSS)

Level 0, Kirk Wing, Hunter Courtyard
Phone: 04-463 5999
Email: student-learning@vuw.ac.nz
Website: **www.victoria.ac.nz/st_services/slss**

Build confidence and maximise your academic success with support from SLSS. They offer workshops and one to one tuition in such areas as essay writing, maths and stats, learning strategies, study skills, and language skills.

SLSS offers regular seminars on topics of interest to postgraduate students, which have included Writing a Research Proposal, Writing a Literature Review, Managing the Research Process, What Makes a Good Argument, and Editing your Thesis.

Student Learning Support facilitates postgraduate writing workshops, helps set up and maintain peer study/support groups and organises other workshops on request. Some individual assistance is also available.

Vic OE (Overseas Exchange for Victoria students)
As a Victoria University student you have the chance to complete part of your degree at a world-class institution overseas and studying towards your Victoria degree while paying domestic fees. For graduate programmes in the school, exchange programmes are only possible for Masters degrees involving course work,and only possible with some exchange destinations.

Vic OE students are eligible for StudyLink loans and allowances. Victoria International will provide some grant funding to all successful applicants.

Eligibility

If you are interested in applying for the Vic OE you must:

- be enrolled as a full-time student at Victoria University of Wellington (at the time of application)
- have completed a year of full-time study by the date of your intended departure
- have achieved a "B" average overall in your studies at Victoria
- be able to demonstrate that you would be a good ambassador for Victoria.

Application Deadlines

16 July 2009 (for study in Trimester 1, 2010)

16 January 2010 (for study in Trimester 2, 2010)

For more information visit the website **www.victoria.ac.nz/exchange**

Funding

Victoria International recently announced it will be providing each successful Vic OE student with grant funding of $1000-$1200. Students are also eligible for full Study Link student loans and allowances (if normally eligible in New Zealand).

For more information contact the Victoria International office on Level 2, Rutherford House, 23 Lambton Quay.

More Information

In addition to the statutes published online at **www.victoria.ac.nz/home/about_victoria/ policy.html** and in the University Calendar students are advised to familiarise themselves with the following publications available from the Faculty or School office or online:

- PhD Handbook (**www.victoria.ac.nz/home/publications/phd_handbook.pdf**)
- Human Ethics Committee Guidelines

Library Information

From your first day the library plays a central role in your university career. A specialist team of science librarians is here to help you. We support the learning and research needs of students at all levels in the Faculties of Science and Engineering. Individual consultations are available with your subject librarian. For details visit us at **http://www.victoria.ac.nz/library/subjectguides/science/index.aspx**.

Services offered by the library include regular library tours, a variety of study spaces for group work or quiet study, computer facilities and access to the latest online resources. To find out more go to the library website at **http://www.victoria.ac.nz/library/** or visit the reference desk in the central library. You can also contact us by phone, email or Instant Messaging through our **Ask a Librarian service** (**http://www.victoria.ac.nz/library/forms/ask-a-librarian.aspx**).

FACULTY OF SCIENCE
Te Wahanga Putaiao

FACULTY OF ENGINEERING
Te Wahanga Ahunui Pukaha

Faculty of Science/Faculty of Engineering Student Administration Office
Location: Level 1, Cotton Building
Email: science-faculty@vuw.ac.nz
Web: http://www.vuw.ac.nz/science
Office hours: 8.30 am – 5.00 pm (Tuesday from 9.30 am)

Student Advisers can help with admission requirements, degree planning, changing courses, transfer of credit from other tertiary institutions, and anything else that may crop up during your time at Vic. They also deal with other aspects of student administration such as enrolment, exams organisation and the maintenance of student records.

The advisers support students throughout their study. To ensure you get good continuity of personal service, advisers manage a particular group of students, identified by the first letter of your surname:

A-H	Belinda Tuari	belinda.tuari@vuw.ac.nz	463 5982
I-Q	Rachel Zhang	rachel.zhang@vuw.ac.nz	463 5983
R-Z	Celia Simpson	celia.simpson@vuw.ac.nz	463 5981

Johan Barnard Manager, Student and Academic Services tel 04-463 5980
Shona de Sain Associate Dean (Students) tel 04-463 5092

Te Rōpu Āwhina
Te Rōpu Āwhina whānau in the Faculties of Science, Engineering and Architecture and Design at Victoria University of Wellington was established in 1999. Āwhina is about people and collective success. The kaupapa of Āwhina is to produce Māori and Pacific science, engineering, architecture and design professionals to contribute to Māori and Pacific development. Anyone who assists the building of Āwhina is part of the whānau.

Website: www.victoria.ac.nz/science/awhina
Contact details: CO148, (04) 463 5987, teropuawhina@gmail.com

FACULTY OF HUMANITIES AND SOCIAL SCIENCES
Te Wahanga Aronui

Faculty of Humanities and Social Sciences Student Administration Office
Location: Level 4, Murphy Building
Phone: 04-463 5745
Email: fhss-student-admin@vuw.ac.nz
Web: http://www.vuw.ac.nz/fhss
Office hours: 10:30 am – 4 pm (Tuesday 12 – 5 pm)

Dr Kristina McGuiness-King Manager, Student and Academic Services tel 04-463 5192
Dr Stuart Brock Associate Dean (Students) tel 04-463 6970

FACULTY OF GRADUATE RESEARCH

Faculty of Graduate Research Office
Location: 10 Kelburn Parade
Phone: 04-463 5233 x7801
Email: Judith.Bagley@vuw.ac.nz
Web: http://www.victoria.ac.nz/phd

Prof Laurie Bauer	Dean	tel 04 463 7408
Prof Maryanne Garry	Deputy Dean	tel 04 463 5769
Judith Bagley	FGR Administrator	tel 04 463 5233 x7801
Jacquie Harper	Postgraduate Research Coordinator	tel 04 463 6112