



**The University of Sydney**

**School of Information Technologies  
Faculty of Engineering and  
Information Technologies**

# **The Survival Guide to Honours 2009**

## Welcome!

On behalf of the School of Information Technologies, we would like to welcome you to the University of Sydney (or welcome you back, if you're an existing University of Sydney student!). This document is not designed to give you all the answers, but to give you a general overview of what to expect in your Honours year. Starting anything new can be daunting, so by reading this document you will learn who you can talk to and where you can go to get help with any aspect of your Honours candidature.

## People

Within the School of Information Technologies, there are a few people to whom you can talk about your candidature:

### **Undergraduate and Honours Director (Semester 1): Dr Josiah Poon**

Josiah can be found in Room 4E-451, School of IT Building, phone 9351-7185, e-mail [josiah@it.usyd.edu.au](mailto:josiah@it.usyd.edu.au). Josiah can help you with any academic aspects of your Honours candidature, such as enrolment advice.

### **Undergraduate and Honours Director (Semester 2): Dr Kalina Yacef**

Kalina will take over from Josiah in Semester 2 and can be found in Room 3W-317, School of IT Building, phone 9351-6098, e-mail [kalina@it.usyd.edu.au](mailto:kalina@it.usyd.edu.au)

### **Admin Officer (Undergraduate and Honours): Linda Kristian-Lambert**

Linda is in Room 2E-225 in the School of IT Building, phone 9351-8961, e-mail [lindak@usyd.edu.au](mailto:lindak@usyd.edu.au). She can help with any administrative queries, and will be in contact with you throughout the year. Linda coordinates the submission of each section of your project work.

## **Your Supervisor**

Your supervisor will be the person who will guide you through your Honours project. The first thing that you should do as an Honours student is to secure a project and a supervisor. There's more information about how to do this below.

## Curriculum Information

All curriculum-related information for the Honours Program can be found on the web and in the Engineering and IT Faculty Handbook. Please consult these before you visit Josiah, the Honours Program Director.

Web information about the Honours Program:

[http://www.it.usyd.edu.au/current\\_students/undergrad/honours/index.shtml](http://www.it.usyd.edu.au/current_students/undergrad/honours/index.shtml)

Faculty of Engineering and IT Handbook (can also be bought as hardcover from the Student Centre):

[http://www.usyd.edu.au/handbooks/engineering/Engineering\\_IT\\_2008.pdf](http://www.usyd.edu.au/handbooks/engineering/Engineering_IT_2008.pdf)

Faculty of Science Handbook (for Science Honours students) (can also be bought as hardcover from the Student Centre):

<http://www.science.usyd.edu.au/about/handbook.html>

## What do I enrol in?

Here is a typical enrolment for full-time BCST (Hons) and BIT (Hons) students. Units of study in bold font are compulsory:

### Semester 1:

- **INFO5993 IT Research Methods** (6 credit points)
- Three units of study from the list attached to this handout (6 credit points each, a total of 18 credit points)

### Semester 2:

- **INFO4991 IT Research Thesis A** (6 credit points): This is the first section of the Honours Project
- **INFO4992 IT Research Thesis B** (12 credit points): This is the second section of the Honours Project
- **INFO4999**: Zero credit points, but this is where your final Honours mark is recorded by the Faculty.
- One unit of study from the list attached to this handout (6 credit points)

For full-time BSc (Hons) students enrolling in the Computer Science stream:

### Semester 1:

- **COMP4011 Computer Science Honours A** (12 credit points)
- **COMP4012 Computer Science Honours B** (12 credit points)

### Semester 2:

- **COMP4013 Computer Science Honours C** (12 credit points)
- **COMP4014 Computer Science Honours D** (12 credit points)

For full-time BSc (Hons) students enrolling in the Information Systems stream:

### Semester 1:

- **ISYS4301 Information Systems Honours A** (12 credit points)
- **ISYS4302 Information Systems Honours B** (12 credit points)

### Semester 2:

- **ISYS4303 Information Systems Honours C** (12 credit points)
- **ISYS4304 Information Systems Honours D** (12 credit points)

If you are part-time, or have queries about what units to enrol in, ask Josiah for advice.

## Important Dates

Please note the following dates:

	Semester 1	Semester 2
<i>Last day to add a unit:</i>	Friday 13 March	Friday 7 August
<i>Last day to withdraw:</i>	Tuesday 31 March	Monday 31 August
<i>Last day to discontinue without failure (DNF):</i>	Friday 24 April	Friday 11 September
<i>Last day to discontinue - fail (DF):</i>	Friday 5 June	Friday 30 October

## Honours Projects

To complete the Honours Program you are required to successfully finish a project that cumulates in the submission of your thesis and a 15-minute presentation showing the results of your work. Although you only enrol in the thesis units in Semester 2, you should work on your project **ALL YEAR**. The project is undertaken with the direct supervision of a full-time member of the academic staff of the School.

A selection of projects can be found at:

[http://www.it.usyd.edu.au/current\\_students/undergrad/honours/project\\_offerings.shtml](http://www.it.usyd.edu.au/current_students/undergrad/honours/project_offerings.shtml)

If you have a particular interest in an area, which is not covered in the list above, you may negotiate a topic with academics that have similar interests.

You should find a supervisor and a project as quickly as possible. By Monday 9 March, you must send Josiah an e-mail telling him the name of your supervisor, project title, abstract (at least 5 sentences), and at least 5 scientific references related to your project.

The project is assessed mainly on the basis of a substantial thesis (usually 50 pages long) and a 15-minute presentation. The thesis is typically due in Week 14, Semester 2. The exact submission date will be announced at the beginning of Semester 2.

## Structure of the Honours Project

This table breaks down the mandatory items that make up the Honours Project. Please note that *only your thesis will be assessed* – the project proposal, poster and presentation are designed to assist with fine-tuning your research question/s and thesis.

Assessment	Due Date
Project Proposal	Monday 9 March
Poster	Week 10, Semester 2 (TBC)
Thesis	Monday 2 November
Project Presentation	Week 14, Semester 2 (TBC)

## Research Conversazione

The Research Conversazione is a chance for the School of IT to showcase the work of its Honours and postgraduate students and is a great opportunity for you to get acquainted with Australian IT employers. Companies also sponsor prizes for the best

Computer Science and Information Systems projects.

This year's Conversazione will be held on Friday 30 October. You can find more information about this event at:

<http://cassius.ee.usyd.edu.au/Foundation/conversazione.html>

For participation you will need to produce a research project poster, which will be printed in A1 size and laminated by the SIT Office. The School will contact you regarding participation in this event closer to the time.

### Honours Computer Desks

You will be provided with a workspace and a computer in your supervisor's research lab. Your supervisor should be able to organise this with the desk allocator of your building wing.

### Swipe Card Access

You will be provided with (or may already have) a swipe card that gives you access to the School of IT Building and your research lab.

If you don't yet have a swipe card, a deposit of \$25.00 is required. This deposit will be refunded when the card is returned. To arrange a swipe card, please see the Reception Desk on Level 2 of the School of IT Building. The receptionist will collect your \$25.00 deposit and issue you a receipt. Please take this receipt to the Workshop on Level 1 in the West Wing of the School of IT Building (adjacent to the lifts), where the Workshop staff will keep your receipt and give you a swipe card.

If you're an existing student and already have a swipe card, please speak to the Workshop staff to update your current access.

### Computer Accounts & Technical Support

The School of IT provides you with a computer account for accessing the computer facilities at the school. If you are here for the first time, you need to see Greg Ryan (located on Level 1 in the East Wing). He will give you the account name and the password for your account. Existing School of IT students can use their current account and password.

A Duty Programmer is on duty each day to assist with software problems. Simply e-mail [dp@it.usyd.edu.au](mailto:dp@it.usyd.edu.au) to report your problem. For technical support, please see the Workshop team on Level 1 in the West Wing.

Please note that any changes to computer hardware are *not permitted*. If you need an upgrade of your computer, please ask your supervisor. They will arrange the required modification with the Workshop staff.

# 2009 HONOURS UNITS OF STUDY

## Semester 1

### **INFO5993 IT Research Methods (Compulsory)**

This unit will provide an overview of the different research methods that are used in IT. Students will learn to find and evaluate research on their topic and to present their own research plan or results for evaluation by others. The unit will develop a better understanding of what research in IT is and how it differs from other projects in IT. This unit of study is required for students in IT who are enrolled in a research project as part of their Honours or MIT/MITM degree. It is also recommended for students enrolled or planning to do a research degree in IT and Engineering.

### **COMP5045 Computational Geometry**

In many areas of computer science - robotics, computer graphics, virtual reality, and geographic information systems are some examples - it is necessary to store, analyse, and create or manipulate spatial data. This course deals with the algorithmic aspects of these tasks: we study techniques and concepts needed for the design and analysis of geometric algorithms and data structures. Each technique and concept will be illustrated on the basis of a problem arising in one of the application areas mentioned above.

### **COMP5046 Statistical Natural Language Processing**

This unit deals with techniques for the automatic processing of natural languages (such as English, French). Methods for various forms of analysis of large corpora such as parsing, part-of-speech tagging, word sense disambiguation, information extraction, question answering, clustering and classifying are treated. Particular emphasis is given to methods that analyse the meaning in texts and the general application of machine learning methods to these topics. Various applications of these methods to research in health texts and other contexts being pursued in the University of Sydney will be explored.

### **COMP5338 Advanced Data Models**

This course will offer a comprehensive survey of post-relational data models and technologies with significant emphasis on spatial, temporal, streaming and XML data types. An overview of OLAP technologies to carry out complex data analysis will also be provided. The important challenges in managing the complex and varied data in modern database environments will be specifically addressed.

### **COMP5348 Enterprise Scale Software Development**

This unit covers a range of approaches and technologies used for constructing large-scale enterprise computer systems. These systems handle critical business processes for large companies and other organisations and so have to be highly reliable, available and scalable. This class of applications are almost always built up from smaller application components, incorporating existing "legacy" code and data stores as well as new code written using new technologies. Constructing, testing and deploying such large, complex systems is a difficult task, and is only achieved through the adoption and use of rigorous software engineering and project control methodologies.

### **COMP5424 Information Technology in Biomedicine**

Information technology (IT) has significantly contributed to the research and practice of medicine, biology and health care. The IT field is growing enormously in scope with biomedicine taking a lead role in utilizing the evolving applications to its best advantage. The goal of this unit is to provide students with the necessary knowledge to understand the information technology in biomedicine. The major emphasis will be on the principles associated with biomedical digital imaging systems and their applications, computer modelling of biomedical systems, and biomedical system identification. Specialist areas such as medical image compression, telemedicine, Picture Archiving and Communication System (PACS), and web technology in biomedicine etc. will also be addressed.

### **COMP5425 Multimedia Storage, Retrieval & Delivery**

The unit covers Multimedia Storage and Compression, fundamental compression techniques, audio storage and compression, image storage and compression (JPEG, JBIG and JPEG2000), video storage and compression (MPEG, MPEG1, MPEG2, MPEG4 and MPEG7), Multimedia Information Retrieval information retrieval fundamentals, visual information retrieval, video cataloguing and retrieval issues of multimedia systems and delivery image watermarking, video watermarking, video encryption, future HCI, progressive transmitted

images and video, multicasting control, immersive video for future digital TV.

#### **COMP5426 Network Based High Performance Computing**

This unit is intended to introduce and motivate the study of high performance computer systems. The student will be presented with the foundational concepts pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. Students will gain skills in evaluating, experimenting with, and optimizing the performance of high performance computers. The unit also provides students with the ability to undertake more advanced topics and courses on high performance computing.

#### **ELEC4605 Computer Architecture**

The digital systems design process. The design cycle. Top down design. Specification. Functional design. Structural design. Testing. Hardware description languages such as Verilog or VHDL. Digital systems architectures. Processors, buses and I/O devices. Synchronous, asynchronous and semi-synchronous buses. Bus interconnections. Memory and I/O interface design. Static and dynamic memory design. Memory interfacing. Interrupts. Vectored interrupts. Interrupt controllers. Parallel interface design. Serial interface design. Bus arbitration. Processor interfacing. IBM PC interfacing. PCB and packaging design, grounding, shielding and power distribution, some case studies.

#### **ELEC5509 Mobile Networks**

This unit is intended to introduce and motivate the study of high performance computer systems. The student will be presented with the foundational concepts pertaining to the different types and classes of high performance computers. The student will be exposed to the description of the technological context of current high performance computer systems. The students will gain skills in evaluating, experimenting with, and optimizing the performance of high performance computers. Students will approach relevant research being done in the University of Sydney.

#### **ELEC5616 Computer and Network Security**

This unit covers a range of approaches for constructing large-scale computer-based systems which can deal with data and business processes through a large company or other organisation. In building software on this scale, it is essential to integrate existing "legacy" code and data stores. This Unit addresses important technological issues of enterprise-scale solutions such as naming, registration, security, and ACID transactions. These concepts are treated at a level that applies across technologies, and students also get practical experience with several technologies of current importance. A crucial factor in the successful delivery of enterprise-scale solutions is the treatment of software development as a 'mission critical' business process. This Unit focuses on recognised skills and techniques for the definition, measurement, evaluation, management, and improvement of enterprise-scale software development processes. Students will approach relevant research being done in the University of Sydney

#### **ELEC5618 Software Quality Engineering**

This unit will cover software quality planning, validation and verification methods and techniques, quality measurement and analysis, software standards and software process improvement and software reliability. Students who successfully complete this unit will: understand the fundamental concepts of software quality; be able to assess the quality of a software design; be acquainted with methods of building for quality; be able to verify and test a unit of code.

#### **INFO5010 IT Advanced Topic A**

This unit will cover some topic of active and cutting-edge research within IT; the content of this unit may be varied depending on special opportunities such as a distinguished researcher visiting the University.

#### **INFO5991 Services Science Management and Eng**

The service sector plays a dominant and growing role in economic growth and employment in most parts of the world and information technology (IT) is a key enabler of this. This unit of study offers IT professionals an understanding of IT-enabled services in a socio-economic and business context, and of the principles of their design, engineering and management in a service-oriented computing framework. Delivery of the unit is driven by a critical approach to the literature and live case studies presented by industry professionals.

#### **INFO5992 Understanding IT Innovations**

An essential skill for an IT manager is the ability to keep up-to-date with emerging technologies, and be able to evaluate the significance of these technologies to their organisation's business activities. This unit of study is based around a study of current technologies and the influence of these technologies on business

strategies. On completion of this unit, students will be able to identify and analyse an emerging technology and write a detailed evaluation of the impact of this technology on existing business practices.

**ISYS5050 Knowledge Management Systems (*Not offered in 2009*)**

This unit will offer a comprehensive introduction to the emerging area of Knowledge Management (KM) from both the technological and organisational perspectives. A diverse range of published papers and other publications that deal with a variety of KM-related topics will be reviewed. Topics include KM: Conceptual Foundations; Taxonomies of organisational knowledge and KM mechanisms; Case/Field Studies of KM Initiatives; Ontologies; Semantic Web; Customer Relationship Management (CRM) systems; Communities-of-Practice; Knowledge Sharing/Open Source Software Development; and Social Network Analysis and KM.

## Semester 2

### **INFO5993 IT Research Methods (Compulsory)**

This unit will provide an overview of the different research methods that are used in IT. Students will learn to find and evaluate research on their topic and to present their own research plan or results for evaluation by others. The unit will develop a better understanding of what research in IT is and how it differs from other projects in IT. This unit of study is required for students in IT who are enrolled in a research project as part of their Honours or MIT/MITM degree. It is also recommended for students enrolled or planning to do a research degree in IT and Engineering.

### **COMP5047 Pervasive Computing**

There is a trend that computers will become invisible and pervasive, as they have shrunk in size tremendously in recent years. As a result, there is a strong need to come up with new approaches and techniques to accommodate these changes. In this unit of study, the students are made aware of the various issues related to pervasive computing, e.g. importance of contextual information in computing, appropriate methods to elicit requirements for pervasive systems, required infrastructure, construction of an adaptive and personalised system, incorporation of new input and output media, and also the psychology and social issues.

### **COMP5048 Information Visualisation**

Information Visualisation and Graph Drawing aim to make good pictures of abstract information, such as stock prices, family trees, and software design diagrams. Well-designed pictures can convey this information rapidly and effectively. The research challenge for Information Visualisation and Graph Drawing is to design and implement new algorithms that produce such pictures. Applications include visualisation of bioinformatics, social network, software visualisation and network visualisation. This unit will provide basic concepts, techniques and fundamental algorithms to achieve good visualisation of abstract information. Further, it will also provide opportunities for academic research and developing new methods for information visualisation.

### **COMP5318 Knowledge Discovery and Data Mining**

Knowledge discovery is the process of extracting useful knowledge from data. Data mining is a discipline within knowledge discovery that seeks to facilitate the exploration and analysis of large quantities of data, by automatic or semiautomatic means. This subject provides a practical and technical introduction to knowledge discovery and data mining. Objectives: Topics to be covered include problems of data analysis in databases, discovering patterns in the data, and knowledge interpretation, extraction and visualisation. Also covered are analysis, comparison and usage of various types of machine learning techniques and statistical techniques: clustering, classification, prediction, estimation, affinity grouping, description and scientific visualisation.

### **COMP5415 Multimedia Authoring and Production**

This unit provides fundamentals on multimedia authoring and production. It focuses on multimedia animation and authoring and introduces some multimedia authoring packages. The students will get a great exposure to the software authoring package Alice. It will study the applications of multimedia authoring in the areas of tele-medicine, progressive animation, multi-casting, and distance learning.

### **COMP5416 Advanced Network Technologies**

The unit introduces networking concepts beyond the best effort service of the core TCP/IP protocol suite. Understanding of the fundamental issues in building an integrated multi-service network for global Internet services, taking into account service objectives, application characteristics and needs and network mechanisms will be discussed. Enables students to understand the core issues and be aware of proposed solutions so they can actively follow and participate in the development of the Internet beyond the basic bit transport service.

### **ELEC5508 Wireless Engineering**

This unit will introduce the key ideas in modern wireless telecommunications networks. It will address both physical layer issues such as propagation and modulation, plus network layer issues such as capacity, radio resource management and mobility management issues. The following topics are covered. Mobile radio channel: Multipath fading, diversity, log-normal fading, mean propagation loss, propagation models. Cellular technologies: Cell types, coverage, frequency reuse, spectral efficiency, link budget, power budget, traffic capacity. Omnidirectional and sectorised antennas. Handover, interaction with the fixed network. Microcells and macrocells, Medium access control: Near-far effect and the hidden terminal problem. Multiple access schemes: FDMA, TDMA, CDMA. Aloha and s-Aloha, carrier sense multiple access, reservation-based MAC schemes, polling, spread-aloha multiple access. GSM: System architecture, radio resource management, mobility management, connection management. Third generation systems: WCDMA and cdma2000. Wireless LANs: IEEE802.11, Hiperlan, Bluetooth. Convergence: GSM evolution to data services via GPRS and EDGE. Issues with TCP over wireless. Mobility management in MobileIP.

### **ELEC5514 Networked Embedded Systems**

This UoS aims to teach the fundamentals concepts associated with: embedded systems programming, real-time operating systems; wireless channel propagation and radio power consumption; power-aware and energy-aware communication protocols; distributed embedded systems problems such as time synchronization and node localization; programming of networked embedded systems; exposure to several recently developed solutions to address problems in wireless sensor networks and ubiquitous computing giving them a well-rounded view of the state-of-the-art in the networked embedded systems field. Student involvement with projects will expose them to the usage of simulators and/or programming some types of networked embedded systems platforms. We expect students to achieve: the ability to identify the main issues and trade-offs in networked embedded systems; understanding of the state-of-the-art solutions in the area; based on the above understanding, ability to analyse requirements and devise first-order solutions for particular networked embedded systems problems; familiarization with a simulator platform and real hardware platforms for network embedded systems through the students' involvement in projects.

### **ELEC5614 Real Time Computing**

This unit is concerned with the theory and practice of real time computer systems as applied to the design of embedded systems and computer control systems in engineering, manufacturing and automation. Some background in programming, object oriented design and system architecture is assumed. A prime aim of this unit of study is to develop a capacity for research and inquiry in the field of real-time and embedded systems. Completion of this unit will facilitate progression to advanced study or to work in embedded systems and industrial real-time computer systems. The following topics are covered. Hard real time and embedded systems, as applied to engineering, manufacturing and automation. Timing and scheduling: periodic vs aperiodic processes, deadlines, rate monotonic, deadline monotonic and earliest deadline scheduling. Management of shared resources. Real-time languages and their features. Real time operating systems. Real time software design. Embedded Systems: overview, signal flow, interfacing. Reliability and fault tolerance in hardware and software. SCADA and DCCS. Some case studies.

### **ELEC5615 Advanced Computer Architecture**

This unit of study is comprised of a selection of topics covering advanced computer architecture, advanced digital engineering and embedded systems. They may be chosen from the following: Advanced Computer Architecture: Processor organisation, parallelism, scalability, language and application driven architectures, design tools and methodologies. Advanced Digital Engineering: Advanced hardware description language skills for ASIC and FPGA design; CAD methodologies; designing for low power, high speed, small area, low cost and testability; advanced printed circuit board design, system design exercises. Advanced Embedded systems: System on chip design and associated hardware description languages and CAD tools; embedded system internetworking; real time design constraints; case studies and laboratory exercises in communications and industrial control applications.

### **INFO5011 IT Advanced Topic B**

This unit will cover some topic of active and cutting-edge research within IT; the content of this unit may be varied depending on special opportunities such as a distinguished researcher visiting the University.

**INFO5991 Services Science Management and Eng**

The service sector plays a dominant and growing role in economic growth and employment in most parts of the world and information technology (IT) is a key enabler of this. This unit of study offers IT professionals an understanding of IT-enabled services in a socio-economic and business context, and of the principles of their design, engineering and management in a service-oriented computing framework. Delivery of the unit is driven by a critical approach to the literature and live case studies presented by industry professionals.

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For further information on these units, please check the Faculty of Engineering and IT Handbook at:

<http://student-handbooks.ucc.usyd.edu.au/handbook/uossearch.stm>