Department of Computer Science
Notes for 400 Level Students

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These notes describe the 2015 programme of studies for 400 level in the Department of Computer Science. They include brief descriptions of the papers, including staff, textbooks, and class times. Those descriptions are tentative and may be changed. Any changes will be described at the first formal meeting of a paper for which changes are made.

We hope you have an interesting and enjoyable year in the department.

Classes

There will be a two-hour meeting for each class each week in each paper, which will be held in G34 or in a lab as appropriate. Classes are relatively informal. We expect you to take an active part in them. You should attend all of them. If you can't, please give your apologies in advance. Changes to class times shown below are possible but very unlikely.

Assessment

Most papers have an examination worth 60% and assignments worth 40% of the final mark. Each paper involves set assignments on various topics. One of the preliminary lecture hand-outs gives the number, due dates, and exact assessment weighting of assignments. Keep that hand-out! Deadlines for submission must be observed; there is a penalty of 10% per working day for late submissions.

Formal three-hour examinations will be held at the normal examination time (end of Semester). Unless otherwise advised you should assume they will be closed book examinations. The Examinations Office will choose the locations close to exam time as usual.

Workload

Workload is always an issue for 400-level students. If you have a problem with workload in a particular paper, speak to the lecturer(s) concerned, or get your class representative to do so. The 400-level courses are always being revised, and your feedback is valued. One important aspect concerns the balance between

semesters. You will find your project work demanding a lot of your time in the second semester.

All projects are worth 40 points; all semester papers are worth 20 points.

Textbooks

While no textbooks are formally required, some are recommended, and students are expected to make considerable use of the University Library for books and periodicals. We have electronic subscriptions to many relevant journals.

User-codes

If you had a departmental user-code last year, you have the same one again this year. However, your password will have been reset.

If you are enrolled in one of these papers and did not have a departmental user-code, we shall give you one.

If you are not yet enrolled in one of these papers, take care of that first.

We provide access to our machines for course-work only. Using them implies that you promise to obey the departmental and University regulations; see `http://www.cs.otago.ac.nz/student/resreg/resreg.php`.

E-mail

Much departmental communication is based on e-mail. You will have an account on a departmental machine, which will be your departmental e-mail address. There is a Web interface to e-mail. If you want your e-mail delivered to some other machine, it is up to you to arrange this. Please make sure you read your e-mail frequently. Coördinators will use e-mail for announcements and messages of interest to 400-level students. We have a skilled and helpful technical support team. You should e-mail requests for help to `cshelp@cs.otago.ac.nz`. They tend to be very busy, especially at the start of a semester.

Going Paperless

The department is trying to reduce its printing costs, so some or all materials for papers may be provided in electronic form rather than on paper. This does not mean that it is any less important for you to read anything we direct your attention to. Assume that even electronic material is examinable unless you are told otherwise. If you find reading on-screen particularly difficult, let your lecturer(s) know so that special arrangements can be made.

Weekly Seminars

We expect our students to attend our seminar programme. Seminars are normally held on Fridays at 1 pm in Owheo 1.06. The atmosphere is informal and many interesting topics are discussed. This is your chance to learn about things we cannot include in the lectures, and to question and argue with the experts.

We are going to lose the seminar room this year. You will be advised later what the new location will be.

Students with disabilities

Students with enquiries about disabilities of any kind, including temporary ones, should contact Kaye Saunders (`kaye@cs.otago.ac.nz`; 479 8397) for further information.

Māori and Pacific students

Alistair Knott (alik@cs.otago.ac.nz) is the department's Māori support person (kaiāwhina), and also has links with the Pacific Island centre. If you would like information about support or mentoring, or have any questions, please contact Alistair.

Special Consideration/Impairment of Performance

If you need to claim special consideration (*e.g.*, due to impairment of performance) in a final examination you should apply through eVision (`https://evision.otago.ac.nz/sitsvision/wrd/siw_lgn`) within five days of your last examination.

If you have a problem that affects your internal assessment, inform this department. If possible, discuss it with your lecturer(s) beforehand.

Description of whole-year papers

Projects are research supervised by a staff member. They last for two semesters. Every project requires a written interim report at the end of the first semester, an oral presentation at the beginning of the second semester, and a written final report at the end.

The written reports are expected to conform to guidelines described in the document "Notes on the Preparation of Theses" (available from the reference section of the library) and to the guidelines supplied by the department. You should read the 2015 Project Guide: see `http://www.cs.otago.ac.nz/papers/coursesum/480-ProjectGuide-2015.pdf`

COSC480 — Project

If you are enrolled in the first year of a two-year Masters degree (MA or MSc), you must take a project paper, and it would normally be COSC480. If you are enrolled in a Postgraduate Diploma (PGDipArts or PGDipSci), you do not have to take a project paper unless you intend to carry on to the one-year MSc or MA by thesis. If you do decide to take a project paper it would normally be COSC480.

A COSC480 project could be a critical literature survey (especially suitable for MSc students) or some software development (especially suitable for Postgraduate Diploma students). It is up to you and your supervisor to work out a suitable workload. We recommend that you select a project topic from our list, but you can suggest another topic, if you can find a staff member who is willing to supervise it. For MSc students the project may lead into next year's thesis; these students will need to arrange a thesis topic and supervisor. We very strongly recommend regular and frequent meetings with your supervisor, whatever kind of project you are doing. We do not enforce this, but your supervisor is there to help and you do not want to fail.

COSC490 — Research Project

If you are enrolled in an Honours degree (BA Hons or BSc Hons), you must take COSC490.

A COSC490 project could be a critical literature survey or some other kind of research. It is up to you and your supervisor to work out a suitable workload. We recommend that you select a project topic from our list, but you can suggest another topic, if you can find a staff member who is willing to supervise it. We very strongly recommend regular and frequent meetings with your supervisor, whatever kind of project you are doing. We do not enforce this, but your supervisor is there to help and you do not want to fail.

Description of papers Offered in Semester 1

COSC410 — Logic for artificial intelligence

This paper involves the study of interpreted formal languages in the context of reasoning agents that may or may not be human, an emphasis which has evolved from the use of logic as a modelling tool in artificial intelligence. Since logic is also central to the study of program correctness, it forms an important building block in any advanced understanding of computer science. We shall also examine Description Logics, which underpin the RDF and OWL "semantic web" technologies.

Time	Thursday 11:00–12:50
Lecturers	Willem Labuschagne and Richard O'Keefe
Assessment	30% internal and 70% examination

COSC420 — Neural Networks

This paper explores the nature of computation, the capabilities of computational systems inspired by the workings of the brain, and the application of such systems to complex topics such as vision, language, learning and memory. Exploring these topics draws on research in several disciplines, such as computer science, neuroscience and psychology.

Time	Tuesday 9:00–10:50
Lecturer	Anthony Robins
Assessment	40% internal and 60% examination

COSC430 — Advanced database topics

This paper examines the theory and practice of database design and administration. It also provides a survey of research in the database field, such as data mining, multidimensional indexing, temporal databases, and distributed database architectures. Practical work setting up and administering an Oracle database is an important part of this paper; this paper of the paper will be held in a lab, not G34.

Time	Monday 10:00–11:50
Lecturers	David Eyers, Cathy Chandra, and Richard O'Keefe
Assessment	40% internal and 60% examination

COSC470 — Special topic, Advanced Logic

This paper addresses some of Charles Sanders Peirce's ideas on logic and how they have influenced 20th century logic.

Time	See lecturer
Lecturer	Willem Labuschagne
Assessment	See lecturer

TELE402 — Internetworking

This paper covers advanced network theory, network programming techniques, and protocol development skills that are useful in both industry and applied research. Topics include socket programming over TCP and UDP, network programming over client-server architecture, concurrent server implementation, name and address resolution, programming over IPv6, multicasting and broadcasting, advanced routing in the Internet, wireless sensor networks, and programming in wireless networks.

The overall aim is to provide students with sufficient background in advanced network theory and to equip students with necessary skills in network programming. This paper will also give students practice in creative thinking about computer networks.

Time	Wednesday 9:00–10:50
Lecturers	Haibo Zhang and Yawen Chen
Assessment	40% Internal and 60% examination

Description of papers Offered in Semester 2

COSC412 — Complexity and Cryptography

This covers complexity classes and their relationships, and the basic theory of cryptography including public key systems. We shall take an "applied" approach.

The overall aim is to provide students with an understanding of the rôle played by various aspects of complexity in modern computing theory, and to explore the modern theoretical bases of cryptography — a central aspect of contemporary computing both in theory and in practice.

Time	Wednesday 11:00–12:50
Lecturers	Michael Albert and David Eyers
Assessment	40% internal and 60% examination

COSC421 — Neural models of language

This paper addresses the question of how language works in the human brain. Answering this question draws on research in several disciplines: neuroscience, psychology, linguistics, and computational modelling. The aim of the course is to provide an accessible introduction to the relevant topics for students from each of these disciplines.

We will approach the topic by focussing on the interface between language and the sensorimotor system. We consider an observer perceiving a simple concrete event (a man grabbing a cup), and examine what is involved in converting the sensorimotor representation of this event to a linguistic representation — for instance, the English sentence "The man grabbed a cup".

You will learn about: the key empirical methods employed in psychology and neuroscience (behavioural experiments, neuroimaging, single-cell recording, lesion studies); some of the influential computational models of sensorimotor cognition and language processing (saliency maps, convolutional networks, motor control, the mirror system, competitive queueing networks, Elman networks, cross-situational word learning); and the basics of two influential syntactic theories (Chomsky's Minimalism and Goldberg's Construction Grammar).

Time	TBA
Lecturer	Alistair Knott.
Assessment	60% internal and 40% examination

COSC440 — Advanced operating systems

This paper covers process management, memory management, I/O systems, and file systems in a real operating system (Linux). It will enable students to write modules working in Linux kernel. Issues such as process management, interrupts and exceptions, device drivers, concurrency, memory management, file systems, interrupt handling, security, and performance optimisations will be discussed and experienced through programming. Modern operating systems research such as microkernels will be exposed through reading materials. This paper will also cover the Windows Research Kernel as a case study and for comparison purposes in a few lectures.

Time	Wednesday 9am (lecture); Wednesday 2pm (laboratory)
Lecturer	Zhiyi Huang
Assessment	100% internal

COSC441 — Concurrent Programming

This paper presents theory and practice of concurrent programming, including locks, transactional memory, and message passing; multicore and distributed systems; and specification and testing of protocols.

Concurrent programming is about building programs in which many activities are taking place, and the existence of and collaboration between these activities is essential to the program's design. In distributed systems, like credit card systems and telephone networks, the activities happen on physically separate machines communicating by sending messages over wires or radio channels. In multicore computers, the activities may take place on one or many cores and they may communicate through shared memory. The difficulties and principles are similar.

Time	Tuesday 11:00–12:50
Lecturer	Richard O'Keefe
Assessment	40% Internal and 60% Examination

COSC450 — Computer Vision and Graphics

A selection of topics from computer vision and computer graphics. Computer vision is the use of algorithms to understand the world from images and video, while computer graphics creates images and video from models of real and virtual environments. These two areas can be viewed as inverses of each other, but are increasingly intertwined. In this paper we will look at several topics in vision and graphics from both a practical and theoretical perspective.

Time	Monday 11:00–12:50
Lecturer	Steven Mills
Assessment	40% internal, 60% examination.

COSC470 — Special Topic, Bioinformatics

This paper continues on from COSC348.

Time	See lecturer
Lecturer	Lubica Benuskova
Assessment	See lecturer

Papers not offered this year

There are some papers in the University Calendar and on our web site which are not being offered this year. You should have sorted that out when you enrolled, but to make sure you know,

- COSC411 — Combinatorial game theory

- COSC422 — Computational neuroscience

- COSC431 — Information retrieval

- COSC471 — Approved special topic

are not being offered this year.

Outside Links

Use Facebook? See `https://www.facebook.com/ComputerScienceOtago`

Code Craft Dunedin "are a group of people interested in software development, learning, and getting together." There is a Web site `http://www.meetup.com/Code-Craft-Dunedin/` and you can join them in `#dunedintech` on `freenode` using IRC.

Dunedin IT (`www.dunedinit.org.nz`) is a "directory [that] highlights high-tech companies that choose to call Dunedin home."

In an article in the Harvard Business Review, `https://hbr.org/2012/07/i-wont-hire-people-who-use-poo`, Kyle Weins explains explains why grammar matters. Read this, and then beg your supervisor to help proofread your reports early and often.