

# Cosc415 Information and Software Visualisation

## Course Programme

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### 1 Introduction

**T**he visual display of information has become the dominant mode of presentation in the interaction between people and software. In recent years, the field of information visualisation has experienced rapid growth. Fundamental techniques of conveying effectively the information “hiding” in data have been used for many years by people such as cartographers. Effective visualisation involves mapping attributes of the application domain to the properties of the visual representation (shape, size, colour, texture, ...) allowing greater insight into the science behind the numbers generated by simulation, numerical analysis and other software. Software visualisation involves the application of information visualisation techniques in the software engineering domain.

### 2 Course aims

Students who achieve a good grade in the course should be able to:

- Demonstrate the ability to work professionally to analyse and solve problems.
- Understand the application of information visualisation techniques in software engineering.
- Design and implement visualisations to support the development and evolution of large software systems.
- Select and apply appropriate information visualisation techniques to meet the users’ needs.
- Locate and make use of relevant research literature

- Use software metrics to understand and improve large software systems.

### 3 Student background

Cosc415 builds on the material introduced in Cosc224, Cosc324 and Cosc325. It is *not* suitable for students who do not have strong background experience in both object-oriented design (including UML) and Java or a similar OO language. Some familiarity with software metrics—ideally to the level covered in Cosc324—will also be assumed. Experience indicates that students who lack the appropriate preparation are unlikely to do well in the course.

Students are encouraged to consult previous years’ examination papers for Cosc324 in the University Library collection. If your background is weak in undergraduate software engineering material, OO and/or software metrics then you should consult with me before enrolling.

Cosc415 includes a significant amount of research-based material: students will be expected to perform independent activities (e.g. read, analyse and report on published papers) and to plan, conduct and report project work involving original contributions.

No prior experience with graphics, visualisation or VRML/X3D will be assumed.

### 4 Communication

The course supervisor is Neville Churcher, room 247, ☎x7767. I attempt to maintain an open-door policy but since I have many constraints on my availability I would encourage you to make an appointment (CSSE administration staff will assist you) with me to ensure that sufficient time will be available. While I do not normally supply model answers, I am happy to address your

Item	Date	Worth
Final Test	TBA	40%
Research review	Tuesday 6th September, 5:00 p.m.	10%
Project	Friday 23rd September, 5:00 p.m.	40%
Portfolio & contribution	-	10%

Table 1: Assessment items

queries, comment on your attempts at questions, suggest things to try and discuss course-related matters with you.

Most information relevant for COSC415 (including this document) will be made available electronically via Learn (Moodle)<sup>1</sup>. A wiki will be a central means of sharing information and repository for course materials. Students are expected to make use of the wiki and contribute to it.

You should refer frequently to the wiki, forums and Learn resources for updated information, copies of course handouts, due dates and discussions about course topics.

## 5 Course Programme

About 20 lectures will be presented during the course. You are strongly advised to read widely so that you will be able to participate fully in classroom discussions. Note that material presented in lectures is normally distilled from a variety of sources. Consequently, you can not expect to gain equivalent value by reading a particular section of a single text or from course handouts alone. Handouts of lecture slides typically include illustrations, examples and bullet point outlines of class discussions. It is particularly important that you prepare for, participate fully in, and contribute to, the lecture process. This includes reading the literature, taking your own supplementary notes in class, private study, attempting previous years' examination questions and discussing your study with lecturers and colleagues.

Individual topics are likely to evolve slightly from year to year to incorporate new developments in the field or cover material related to specific assessment items.

Topics expected to be covered include:

- Software engineering review
- Introduction to visualisation

<sup>1</sup><http://learn.canterbury.ac.nz>

- Information visualisation techniques
- Tools and languages, including Virtual Reality Modelling Language (VRML/X3D), for information visualisation
- Software visualisation

## 6 Assessment

The items of assessment for the course are summarised in Table 1. Notices and/or electronic mail will be used to inform you of any additions or alterations to assessment or teaching schedules. Students are expected to consult the department's on-line notices system regularly. In the event of any discrepancy the on-line notices should be regarded as authoritative.

- Normally, the COSC415 final test is open-book and calculators are normally allowed. Details of any restrictions which will apply in the 2011 test will be announced via the Learn.
- Project topics must be confirmed by 5:00p.m. Thursday 4th August (but should be done well before then).
- Research review selections must be confirmed by 5:00p.m. Thursday 11th August (but should be done well before then).
- In order to confirm research review or project topics you will need to provide a brief written proposal as the basis for discussion. If you have not confirmed a topic then you may not proceed further.
- Research review presentations will begin in the week 12–16 September.
- Project presentations will be arranged in the week 26–30 September.
- “Portfolio & contribution” includes contributions to the COSC415 wiki, homework exercises and “treasure hunts”.

The department's standard policy for drop dead dates with 15% penalty applies to assignments for the course.

## 6.1 Scaling

In order to ensure that your results are consistent with the assessment standards of previous years it is sometimes necessary to scale the mark distributions for individual assessment items. Normally, scaling leads to higher grades. However, in exceptional circumstances, it is possible for some grades to be lowered by scaling. Consequently, you should not omit any items of assessment because you think you have already done enough to pass. Your final grade will depend on *at least* the following factors: your absolute mark (the weighted sum of your marks for each individual component), the mean mark for the class and the relative position of your absolute mark in the class.

## 6.2 Invigilated work

Please note that the following requirement applies to all COSC courses:

In order to pass the course:

1. You must meet the absolute passing mark for the class. (In other words, the percentage on all your scored items must meet the absolute passing mark set for the class.) Marks are sometimes scaled to achieve consistency between courses from year to year, thus, specific passing marks are identified on a class by class basis. For example, a total mark of 50% would typically be required to achieve a C pass, but this will vary. A C pass indicates that we believe you have (just) mastered the material in the course. Your ranking in the class may be a more useful indicator of your progress; students ranked above you will receive higher grades, and vice versa.
2. You must average at least 45% on the invigilated assessment items. (Invigilated assessment items are those completed under exam conditions, such as oral and written exams and lab tests.) If you achieve less than 45% over these items, you will receive a C- (for 100- and 200-level courses only), D, or E, depending on your marks.

## 7 Other important information

There are several important documents available online about departmental regulations, policies and guidelines that you must acknowledge in order to continue having access to departmental resources. Within the first two weeks of the semester you should go to the following web page and acknowledge the information there (see the instructions on the web page). <http://www.cosc.canterbury.ac.nz/regulations/>

Notices about this class will be posted to the class forum in the Learn system (<http://learn.canterbury.ac.nz>). COSC students will also be made members of a class called "CSSE Notices", where general notices will be posted that apply to all classes (such as information about building access or job opportunities).

## 8 Textbooks and resources

There is no single recommended textbook for the course. The UC Libraries contain many relevant books, periodicals, conference proceedings and other resources—many of which are also available electronically. These include books on VRML [1, 8, etc.] and visualisation [2, 3, 9, 5, 6, 7, etc.] and software visualisation [10, 4, etc.].

## 9 Professional development

In addition to your regular coursework you should plan to spend some time each week familiarising yourself with developments and current events both in software engineering and the wider computing scene. Places to begin include:

**Weekly magazines** such as *Computerworld New Zealand* are held in the Engineering & Physical Sciences Library and some are available online. Central (James Hight) Library holds a selection of newspapers, many of which have technology sections.

**Journals** such as the *Communications of the ACM*, *IEEE Software* *IEEE Computer* are also readily accessible to students of your level and are available on-line via the University of Canterbury library web pages.

**Seminars** are held in the department on Fridays at 3:10 (see <http://www.cosc.canterbury.ac.nz/seminars> for the programme). Seminars provide an opportunity to learn more about research activities carried out in the department and to hear visiting speakers from industry and other universities around the world.

**Professional societies** Information about student memberships of the ACM, IEEE and NZCS is available from the department.

## Textbooks & recommended reading

- [1] A.L. Ames, D.R. Nadeau, and J.L. Moreland. *VRML 2.0 Sourcebook*. J. Wiley & Sons, 2nd edition, 1997.
- [2] S.K. Card, J.D. Mackinlay, and B. Shneiderman, editors. *Readings in Information Visualisation: Using Vision to Think*. Morgan Kaufman, 1999.
- [3] R. Spence. *Information Visualisation*. Addison-Wesley, 2001.
- [4] J. Stasko, J. Domingue, M.H. Brown, and B.A. Price, editors. *Software Visualization: Programming as a Multimedia Experience*. MIT Press, 1998.
- [5] E.R. Tufte. *Envisioning Information*. Graphics Press, Cheshire, Connecticut, 1990.
- [6] E.R. Tufte. *Visual Explanations: Images and Quantities, Evidence and Narrative*. Graphics Press, Cheshire, Connecticut, 1997.
- [7] E.R. Tufte. *The Visual Display of Quantitative Information*. Graphics Press, 2nd edition, 2001.
- [8] J.R. Vacca. *VRML Clearly Explained*. AP Professional, 2nd edition, 1998.
- [9] Colin Ware. *Information Visualization: Perception for Design*. Morgan Kaufman, 2nd edition, 2004.
- [10] Kang Zhang, editor. *Software Visualisation: From Theory to Practice*. Kluwer Academic Publishers, 2003.