School of Computing and Information Systems

Unit Outline

KXT312 Advanced Algorithmic Problem Solving & Programming

Winter, 2011

Sandy Bay Campus, Hobart
Newnham Campus, Launceston

Unit Coordinator

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UNIT OVERVIEW

Introduction

This unit provides highly able students with an opportunity to extend their knowledge of algorithms and their ability to solve algorithmic problems through to the point of a working program implementing the algorithmic solution. The unit has a problem solving based focus and includes the following topics: advanced graph algorithms, arithmetic algorithms, geometric algorithms, and C++ programming (procedural, object-based, and generic).

Prerequisites

KXT201 and an HD grade in at least one of: KXT102, KXT201, KXT303, KXT304

Unit Weight

12.5% of one academic year

Teaching Pattern

Monday 4th July to Friday 8th July:
Classes will be held between 10am and 6pm.
(Students will be expected to attend all classes and to work on self study activities before and after class times.)

Unit Content

1. Procedural, object-based and generic C++ programming.
2. Advanced Graph Algorithms
3. Geometric Algorithms
4. Arithmetic Algorithms
5. Other Algorithms

Prior Knowledge and/or Skills

Students are assumed to have a solid knowledge of algorithms as covered in KXT201, and excellent programming
Learning Outcomes

On successful completion of this unit, you will be able to:

1. Demonstrate foundational computing knowledge (as included in the unit) of:
   - C++ programming
   - advanced algorithms (and data structures) and their complexity, and algorithm design techniques

2. Apply knowledge of computing principles and technical skills to solve problems by:
   - using abstraction and computational thinking
   - analysing the run-time and space complexity of potential algorithmic solutions
   - using advanced algorithms (and data structures)
   - creating C++ programs according to specifications

3. Act professionally by:
   - communicating in diverse modes to a technically competent audience
   - working and learning independently

Generic graduate attributes

The university has defined a set of generic graduate attributes expected in its graduates. [http://www.utas.edu.au/__data/assets/pdf_file/0010/29917/genericattributes_grads1.pdf](http://www.utas.edu.au/__data/assets/pdf_file/0010/29917/genericattributes_grads1.pdf) Your course is designed to enable you to develop generic skills that are valued in, and expected of, graduates. These are skills that you will need to develop over time. Hence you are encouraged to look for opportunities, as you study each unit, to reflect on and improve these skills.

- Knowledge
  - Students will gain an understanding of algorithms that are used to solve high level computational problems.
  - Students will develop skills that will enable them to use written materials and practical exercises to reach an understanding of complex algorithms they have not previously encountered.

- Communication Skills
  - Students will learn to present complex ideas in a manner that is comprehensible to their peers.

- Problem Solving
  - Students will learn to analyse computational problems and to make reasoned decisions about algorithmic approaches that are applicable to a particular problem.

- Global Perspective
  - Students will be able to begin to comprehend the work of the world wide community of professionals who work on developing and applying complex algorithmic techniques.

UNIT ASSESSMENT

Assessment Pattern

In-semester (100%)

Assessment Summary

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in Learning Activities</td>
<td>10%</td>
<td>Continuously In Class</td>
</tr>
<tr>
<td>Practical Problem Solving and Programming Test 1</td>
<td>30%</td>
<td>2pm Sunday 10th July</td>
</tr>
<tr>
<td>Practical Problem Solving and Programming Test 2</td>
<td>30%</td>
<td>2pm Sunday 17th July</td>
</tr>
<tr>
<td>Written Assignment and Presentation</td>
<td>30%</td>
<td>1:30pm Sunday 31st July</td>
</tr>
</tbody>
</table>

Assessment Items

**Item 1**
- **Title:** Participation in Learning Activities
- **Type:** In-Semester - learning tasks
- **Task Length:** not applicable
- **Weighting:** 10%
- **Links to Learning Outcomes:** 1, 2, 3
- **Due:** Continuously In Class
- **Description:** Students will be expected to attend, and appropriately participate in, all classes, and complete tasks between classes. Their performance in this will be assessed.

**Item 2**
- **Title:** Practical Problem Solving and Programming Test 1
- **Type:** In-Semester - test
- **Task Length:** 3 hours
- **Weighting:** 30%
- **Links to Learning Outcomes:** 1, 2, 3
Due: 2pm Sunday 10th July
Description: Students will be tested on their individual ability to solve computational problems by identifying appropriate algorithms and correctly implementing them in C++ programs. The test will occur in a closed lab environment, and students will have a (partial) “catch-up” opportunity in an open environment for the 120 hours after the test.

Item 3
Title: Practical Problem Solving and Programming Test 2
Type: In-Semester - test
Task Length: 3 hours
Links to Learning Outcomes: 1, 2, 3
Due: 2pm Sunday 17th July
Description: Students will be tested on their individual ability to solve computational problems by identifying appropriate algorithms and correctly implementing them in C++ programs. The test will occur in a closed lab environment, and students will have a (partial) “catch-up” opportunity in an open environment for the 120 hours after the test.

Item 4
Title: Written Assignment and Presentation
Type: In-Semester - individual assignment
Task Length: not applicable
Links to Learning Outcomes: 1, 2, 3
Due: 1:30pm Sunday 31st July
Description: Students will have to investigate an algorithm outside the scope of the unit and illustrate its implementation and application to an example problem, presenting their work both in the form of a written report and a presentation to the class. (Each student's choice of algorithm requires the approval of the unit coordinator.)

How your Final Grade will be determined
In order to obtain a PP or better, students must obtain at least 50% overall and at least 45% in both:

- The combined total of assessment items 1 and 4.
- The combined total of assessment items 2 and 3.

UNIT RESOURCES

Prescribed Text
None

Readings
Readings will be prescribed during the unit.

Software
The software that you will need to study this unit, including general purpose software, such as word processors, is provided on the computers in the School's computing labs.
If you intend to use software on other computers please check that the versions are compatible.
GENERAL RESOURCES

**School Website**
School of Computing and Information Systems - Faculty of Science, Engineering, and Technology.
http://www.cis.utas.edu.au

**Faculty Website**
Information and Resources for Faculty of Science, Engineering and Technology students are available on the faculty website at: http://www.utas.edu.au/scieng

**University Website**
Information and Resources for 'Current Students' are available on the university website at: http://www.utas.edu.au/students/

**School Help Desk**
Contact the School Help Desk if you have any queries or problems with accessing, using, or printing from the computers in the School of Computing and Information Systems labs.

In Hobart the Help Desk is located on level 3 in the Centenary Building, and is open from 10:00am-12:00pm, and 2:00pm-4:00pm Monday-Friday. The phone number is 6226 2929.

In Launceston the Help Desk is located near the entrance to the computing labs and is open from 10:00am-12:00pm, and 2:00pm-4:00pm Monday-Friday. The phone number is 6324 3447.

Both help desks will accept queries over the phone outside the standard opening hours.

The computer labs at the Cradle Coast Campus are maintained by ITR - please contact the University Help Desk for assistance with these computers.

**Computing Facilities**
The School has PC labs (running Windows 7), Mac labs (running Mac OS X 10.6), and special purpose Networking labs at the Newnham and Sandy Bay campuses. All students are provided with logins for Windows, Macintosh and Unix environments. If you have not used these facilities before please contact the School Help Desk to collect your account details. If you would like to access these facilities after hours please contact the School Help Desk.

In Hobart, there are 4 PC Labs, 2 Mac Labs, and 1 Networks Lab in the Centenary Building. In Launceston, there are 2 PC Labs, 1 Mac Lab, 1 Networks Lab, and one Multipurpose Lab in Building V.

**Use of Facilities**
Use of computing facilities provided by the School is subject to the School's Ethics Guidelines, details of which are posted at http://www.cis.utas.edu.au/cisview/ethics.jsp. Copies of the guidelines are also available in all School labs. The School's facilities may only be used for study-related purposes, and may not be used for personal gain. Anti-social behaviour in labs such as game playing, viewing pornography, loud discussion, audio without the use of head-phones, etc is strictly prohibited in all labs at all times. Eating, drinking, and smoking is not permitted in the labs. Before being granted access to the School's facilities, you will be required to sign a declaration that you have read and understand these guidelines, and that you will abide by them. Disciplinary action may be taken against students who violate the guidelines.

**Learning Strategies**
If you need assistance in preparing for study please refer to your tutor or lecturer. For additional information refer to the Learning Development website: http://www.utas.edu.au/learndev/

Some of the units you will study use videoconferencing to deliver lectures and tutorials. To enable you to get the best out of a videoconference please refer to the following guide: http://www.its.utas.edu.au/videoconf/vcstudentguide.pdf

**Help resolving concerns about this unit**
In the first instance you should contact your lecturer. If the matter is not resolved then you should contact the Head of School. If the matter is still unresolved and you would like to know who to contact or the procedures for resolving your concern refer to the following website: http://acserv.admin.utas.edu.au/complaints_info.html
The Tasmanian University Union (TUU) may also be able to assist.

The School reserves the right to alter the details contained in this Unit Outline. Students will be advised of changes to the outline via their University email account and it remains the responsibility of the student to check their email for such changes.

**Occupational Health and Safety**

The university is committed to providing a safe and secure teaching and learning environment. For more information see [http://www.admin.utas.edu.au/hr/ohs/pol_proc/](http://www.admin.utas.edu.au/hr/ohs/pol_proc/)

**University Services and Support**

If you are experiencing difficulties with your studies or assignments, have personal or life planning issues, disability or illness which may affect your course of study, you are advised to raise these with your lecturer in the first instance.

The University has staff available to assist you, such as the:

- Learning Development Advisor
- Student Counselor
- Careers Advisor
- Disability Officer

For more information and contact details see the Services and Support section on the University 'Current Students' web page: [http://www.utas.edu.au/students/](http://www.utas.edu.au/students/)

**GENERAL ASSESSMENT**

**Approach to Learning**

The University is committed to high standards of professional conduct in all activities, and holds its commitment and responsibilities to its students as being of paramount importance. Likewise, it holds expectations about the responsibilities students have as they pursue their studies within the special environment the University offers.

The University's Code of Conduct for Teaching and Learning states:

Students are expected to participate actively and positively in the teaching/learning environment. They must attend classes when and as required, strive to maintain steady progress within the subject or unit framework, comply with workload expectations, and submit required work on time.

You are expected to spend about 130 hrs studying in this unit - this includes attendance at scheduled teaching sessions. (For a 13 week semester this is, on average, 10 hr/wk.) This is the amount of study time that the 'typical' student will need to reach the level of competence and understanding required to fulfil the unit objectives. You are expected to:

- attend all scheduled teaching sessions, unless otherwise notified by the unit coordinator
- prepare for, and actively participate in all scheduled teaching sessions
- complete the assigned learning tasks
- review what has been learnt
- complete assessment items and submit them on time
- access and be familiar with the information and resources available on the unit website
- seek help from teaching staff if you have any questions or difficulties in studying this unit


It is expected that students will consult email sent to their University email address at least twice a week for notices relating to the administration of the unit, and for notification of the results of assignments.

It is expected that students will read the background material specified in the course curriculum, will actively attend and participate in tutorials, and be prepared to discuss relevant issues arising with tutors, lecturers and fellow students.

**Student Expectations of the Unit**

Students enrolled in this Unit may reasonably expect the following:
1. To be able to contact a lecturer or tutor by electronic mail, to raise issues arising in the unit, either relating to content or student performance within the unit.
2. Subject to availability, to be able to discuss such issues in person with the lecturer or tutor.
3. That assignments will be marked and the marks will normally be returned within 3 weeks of due dates.
4. That all relevant notices regarding the administration of the unit, including any necessary changes, will be communicated to all students enrolled in the unit via email.

These expectations are in addition to those specified in relevant University regulations.

Plagiarism

Unless specifically stated in the specification of the assessment item provided on the unit website, it is required that:

- work submitted by a student is the work of that student alone OR
- where the assessment item is to be completed by a group of students, the work submitted by the group of students is the work of that group of students alone.

While students are encouraged to discuss the assignments in this unit and to engage in active learning from each other, it is important that they are also aware of the University’s policy on plagiarism. Plagiarism is taking and using someone else's thoughts, writings or inventions and representing them as your own; for example downloading an essay wholly or in part from the internet, copying another student’s work or using an author’s words or ideas without citing the source.

"Plagiarism is a form of cheating. It is taking and using someone else's thoughts, writings or inventions and representing them as your own; for example, using an author's words without putting them in quotation marks and citing the source, using an author's ideas without proper acknowledgment and citation, copying another student's work.

If you have any doubts about how to refer to the work of others in your assignments, please consult your lecturer or tutor for relevant referencing guidelines, and the academic integrity resources on the web at http://www.academicintegrity.utas.edu.au.

The intentional copying of someone else's work as one's own is a serious offence punishable by penalties that may range from a fine or deduction/cancellation of marks and, in the most serious of cases, to exclusion from a unit, a course or the University. Details of penalties that can be imposed are available in the Ordinance of Student Discipline – Part 3 Academic Misconduct, see http://www.utas.edu.au/__data/assets/pdf_file/0006/23991/ord91.pdf.

The University and any persons authorised by the University may submit your assessable works to a plagiarism checking service, to obtain a report on possible instances of plagiarism. Assessable works may also be included in a reference database. It is a condition of this arrangement that the original author's permission is required before a work within the database can be viewed."

It is important that you understand this statement on plagiarism. Should you require clarification please see your unit coordinator or lecturer. Useful resources on academic integrity, including what it is and how to maintain it, are also available at: http://www.academicintegrity.utas.edu.au.

Referencing

The preferred text referencing systems for the School is the Harvard system (also referred to as the author-date system). In your written work you will need to support your ideas by referring to scholarly literature, works of art and/or inventions. For information on presentation of assignments, including referencing styles: http://utas.libguides.com/referencing

It is important that you understand how to correctly refer to the work of others and maintain academic integrity. Failure to appropriately acknowledge the ideas of others constitutes academic dishonesty (plagiarism), a matter considered by the University of Tasmania as a serious offence. The university document on plagiarism contains information about referencing the work or ideas of others (see http://www.utas.edu.au/plagiarism/).

Submissions

The details of the submission method (paper, electronic or other) for each assignment will be supplied in a separate assignment specification sheet. All in-semester assignment submissions (including electronic submissions) are to include an Assignment Cover Sheet which includes a statement confirming that the submission is your own work. The Assignment Cover Sheet is available from the School Help Desk in Launceston and Hobart, and on the School’s web site: http://www.cis.utas.edu.au/cisview/resources.jsp.

Students must take responsibility for the correct submission of their assignments. Students are expected to adhere to the following procedure for submission:

- Submitted files MUST be checked by the student to ensure that correct submission of the file has been
Students are expected to notify the Lecturer WITHIN TWO HOURS of submission if their files have not been submitted correctly. Students must take responsibility for safely backing up of their own files during the academic year to ensure that no files are permanently lost.

**Extensions**


**Review of Assessment and Appeals**

1. It is expected that students will adhere to the following policy for review of any piece of continuous assessment.
   a. Within 5 days of the release of the assessment result, the student should request an appointment with the Lecturer. The student should be prepared to discuss specifically which section of the marking criteria they are disputing and why they consider the mark is inappropriate.
   b. Following this discussion, students may request a formal remark of the original submission (in accordance with Rule of Academic Assessment 111, clause 22.1). This remark will be undertaken, where practicable, by an alternative assessor.
2. Students may also request a review of the final result in a unit. The request and payment must be made within 10 days from the date of the result notification. Students are referred to Rule of Academic Assessment 111, clause 23 at [http://www.utas.edu.au/university-council/university-governance/rules](http://www.utas.edu.au/university-council/university-governance/rules) and [http://www.studentcentre.utas.edu.au/examinations_and_results/results/result_review_results.htm](http://www.studentcentre.utas.edu.au/examinations_and_results/results/result_review_results.htm).

**Complaints Procedure**

It is expected that students will adhere to the following policy for making any complaint or grievance directly related to a Unit:

a. In the first instance, students are to approach the Lecturer or Unit Coordinator concerned and arrange a time to speak with them about their concern.

b. If an issue remains unresolved, the student should approach the Head of School and arrange a time to speak with them about their concern.

If the School’s internal policy of complaints is unable to resolve an issue, students should consult Ordinance 8 Student Complaints for further direction, see [http://acserv.admin.utas.edu.au/complaints_info.html](http://acserv.admin.utas.edu.au/complaints_info.html).

**Final Grade**

Passing grades will be awarded based on the AVCC guidelines:

- PP at least 50% of the overall mark but less than 60%
- CR at least 60% of the overall mark but less than 70%
- DN at least 70% of the overall mark but less than 80%
- HD at least 80% of the overall mark

In order to comply with the benchmarks set by the Faculty of Science, Engineering & Technology for distribution of grades in units, both the in-semester and examination marks that students obtain may be adjusted either upwards or downwards. See [http://fcms.its.utas.edu.au/scieng/scieng/policies.asp](http://fcms.its.utas.edu.au/scieng/scieng/policies.asp) for details of the Faculty Assessment Guidelines.