Unit Outline: KXA359 Knowledge-Based Systems

Semester 1, 2005

Sandy Bay Campus, Hobart
Newnham Campus, Launceston

Prerequisites
KXA252

Corequisites
None

Unit Weight
12.5% of one academic year

Unit Coordinator
Dr. Peter Vamplew

Lecturing Staff
Newnham Campus, Launceston: Dr. Graeme Faulkner
Sandy Bay Campus, Hobart: Dr. Peter Vamplew

Scheduled Teaching Sessions
Lectures: 3 hr/wk
Tutorials: 1 hr/wk (from week 2)
The Unit Timetable can be accessed from the Study Resources section of the School website. (http://www.comp.utas.edu.au/app/studyresources.jsp).

Unit Website
The unit website is accessed from http://vista.utas.edu.au/. You will need to use your university email pop account username and password to log on to the WebCT system. Once authenticated by the system your personalised MyWebCT area will be displayed. It contains links to the websites that you have permission to access - including the website for this unit.
This unit is Web Supplemented. This means that the use of the Web is optional for this unit. The unit website contains unit information and resources.
If you are not able to access the unit website, please contact the University IT help desk:
   Entrance Level, Morris Miller Library, Sandy Bay Campus;
   Entrance Level, Launceston Campus Library, Newnham Campus.
   Telephone: 6226 1818 and 1300 304 903.
The 1300 number is a local call from within Tas, with the exception of mobiles.
Email: servicedesk@utas.edu.au
Website: http://www.utas.edu.au/servicedesk/student/index.html

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

Provider
School of Computing - Faculty of Science, Engineering, and Technology. http://www.comp.utas.edu.au

OVERVIEW

Introduction
Introduces the principles underlying the development of expert or knowledge-based systems and provides students with the knowledge engineering skills needed to develop a medium-scale expert system, using an appropriate development tool. The unit covers backward-chaining, forward-chaining and object-oriented expert systems and introduces a range of manual and semi-automated knowledge acquisition methods. Reasoning techniques for handling uncertain knowledge are discussed and the unit also examines other types of knowledge-based systems including case-based reasoning, simulations, semantic web applications and Cyc.

Learning Outcomes
On successful completion of this unit, you will be able to:
1. Develop rule-based and object-oriented expert systems in the CLIPS/COOL development language
2. Understand the processes involved in knowledge systems and engineering.
3. Apply techniques for handling uncertainty within knowledge-based systems
4. Demonstrate awareness of current and future applications of knowledge-based systems

Unit Content
• Introduction to Expert Systems
- Knowledge Representation and Inference
- Backward Chaining Rule-Based Systems
- Forward Chaining Rule-Based Systems
- The Knowledge Engineering Process
- Knowledge Acquisition and Analysis Techniques
- Frame-Based Systems
- Reasoning under Uncertainty
- Fuzzy Logic
- Bayesian Belief Networks
- Truth Maintenance Systems
- Case-based Reasoning
- Knowledge-based Simulation
- The Semantic Web
- Cyc

For more information see the section titled 'Content' on the unit website.

**Generic Skills**

The university has defined a set of generic graduate attributes expected in its graduates. [http://www.admin.utas.edu.au/HANDBOOKS/UTASHANDBOOKS/RULES/POLGEN.html](http://www.admin.utas.edu.au/HANDBOOKS/UTASHANDBOOKS/RULES/POLGEN.html) 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.

**LEARNING AND TEACHING**

**Approach to Learning**

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 lectures and tutorials, unless otherwise notified by the unit coordinator
- prepare for, and actively participate in lectures and tutorials
- 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

You are encouraged to read the university's *Code of Conduct for Teaching and Learning*. Part A describes the 'Responsibility of the University to Students' and part B describes the 'Responsibilities of Students to the University'. [http://www.admin.utas.edu.au/HANDBOOKS/UTASHANDBOOKS/RULES/CTEA.html](http://www.admin.utas.edu.au/HANDBOOKS/UTASHANDBOOKS/RULES/CTEA.html)

**Schedule**

See the 'Schedule' section on the unit website.

**Teaching and Support Staff**

**Teaching Staff**

**Unit Coordinator:**

Dr. Peter Vamplew  
E-Mail: Peter.Vamplew@utas.edu.au  
Phone: (03) 6226 2932  
Room: 461, Sandy Bay Campus, Hobart

**Lecturing Staff**

Newnham Campus, Launceston: Dr. Graeme Faulkner  
Sandy Bay Campus, Hobart: Dr. Peter Vamplew

**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 labs.
Hobart: the Help Desk is located near the School's reception desk and is open from 10am - 4pm Monday-Friday. The phone number is 6226 2960.

Launceston: the Help Desk is located near the entrance to the computing labs and is open in the morning from 10am - 12pm, and in the afternoon from 2pm - 4:30pm, Monday-Thursday. On Fridays it is open from 10am - 12pm in the morning and 2pm - 4pm in the afternoon. The phone number is 6324 3447.

Brunie: the computer labs at the NWC are maintained by ITS. Please contact the University Help Desk for assistance. The 6 Macs are maintained by the School of Computing. If you have a query or problem that is specific to the School of Computing please phone the School of Computing Help Desk in Launceston.

University Services and Support

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/)

Resources

Unit Website

The unit website contains unit information and resources.

Prescribed Text

Readings

- Durkin, J. 1993, Expert Systems: Catalog of Applications, Intelligent Computer Systems. [You will need to see the reference librarian to get access to this book.]

Software

The software that you will need to access the unit website and 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.

Software used in this unit includes:

CLIPS 6.0 or above (Available for Mac and PC - on the CD-ROM which comes with the book by Giarratano and Riley, or can be downloaded from [http://www.ghg.net/clips/CLIPS.html](http://www.ghg.net/clips/CLIPS.html))

CLIPS User Manuals (Available on CD-ROM which comes with the book by Giarratano and Riley)

Computing Facilities

The School has PC labs (Windows XP), Mac labs (Mac OS-X 10.3), and Networking labs at the Newnham and Sandy Bay campuses. It also maintains 6 Macs (Mac OS-X 10.3) at the NW Centre. Unix accounts can be accessed from all Macs and PCs.

If you have not used these facilities before please contact the School Help Desk to organise your account details. If you would like to access the facilities at the Newnham and Sandy Bay campuses after hours please contact the School Help Desk.

Please contact the School Help Desk if you have difficulty accessing or using these facilities.
Use of Facilities

Use of computing facilities provided by the School is subject to the School's Ethics Guidelines - http://www.comp.utas.edu.au/app/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. The playing of games is strictly prohibited in all labs at all times. 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.

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/

ASSESSMENT

Assessment Items

Item 1

Title: Assignment 1  
Type: In-Semester - individual assignment  
Weighting: 10%  
Due: 3pm, Wednesday 27th April (Week 9)

Implementation of a rule-based expert system in CLIPS

Item 2

Title: Assignment 2  
Type: In-Semester - individual assignment  
Weighting: 20%  
Due: 3pm, Wednesday 25th May (Week 13)

Implementation of a heuristic, object-oriented expert system using COOL

Item 3

Title: 3 hr Examination  
Type: Formal Examination  
Weighting: 70%  
Due: University Examination Period

This will be an open-book exam: you may take in any written or printed material relevant to the examination.

See the 'Assessment' section in unit website for more detailed information about assessment items.

In-Semester Assessment

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.

The markers for this unit will be using plagiarism-detection software, which compares submitted files and reports similarities between them and the work submitted by other students or material from on-line sources.

Plagiarism

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; or
- 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.utas.edu.au/tl/supporting/academicintegrity/index.html.

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/policy/subject.html#students.

The University reserves the right to submit assignments to plagiarism detection software, and might then retain a copy of the assignment on its database for the purpose of future plagiarism checking.

Referencing

The university document on plagiarism contains information about referencing the work or ideas of others. (See http://www.utas.edu.au/plagiarism/.) The preferred text referencing systems for the School is the Harvard system (also referred to as the author-date system).

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. If this undertaking is not signed, the assignment will not be marked. The Assignment Cover Sheet is available from the School Help Desk in Launceston and Hobart, and on the School's web site http://www.comp.utas.edu.au/app/studyresources.jsp.

Extensions

Assessment items will not be accepted after the due date except under the conditions stated in the school policy on late assessment. http://www.comp.utas.edu.au/app/late_assess.jsp

Formal Examination

The formal examination is conducted by the University Registrar. The 'Current Students' section on the university website contains information about the conduct of, and timetable for, formal examinations.

Final Grade

Overall assessment will be based on the student's performance throughout the semester as well as in a formal examination. In order to achieve a pass (or better) result, a student must obtain:

1. at least 40% of the total mark for in-semester assessment items
2. at least 40% of the mark for the formal examination
3. at least 50% of the overall mark

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

The maximum mark awarded to a student who fails the unit will be 44.

For more information, including other grades such as Supplementary and Terminating grades, see the School of Computing's guidelines for assessment - available at: http://www.comp.utas.edu.au/app/assess.jsp