Unit Outline: KXA437 Embedded Systems

Semester 2, 2006

Sandy Bay Campus, Hobart
Newnham Campus, Launceston

Prerequisites
None

Corequisites
None

Unit Weight
12.5% of one academic year

Unit Coordinator
Dr. Dan Rolf and Dr. Waheed Hugrass

Lecturing Staff
Dr. Waheed Hugrass
E-Mail: Waheed.Hugrass@utas.edu.au
Phone: (03) 6324 3993
Room: V167, Newnham Campus, Launceston

Details of Teaching Arrangements
Lectures: Lectures 2 hr/wk, Practical 2 hr/wk
The Unit Timetable can be accessed from the Study Resources section of the School website. ([http://www.comp.utas.edu.au/app/studyresources.jsp](http://www.comp.utas.edu.au/app/studyresources.jsp)).
All sessions are delivered via video conference.

Unit Website
The unit website is accessed from [http://www.utas.edu.au/coursesonline/](http://www.utas.edu.au/coursesonline/). 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 Dependent: content. This means that you will need to use the Web 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

University Website
Information and Resources for ‘Current Students’ are available on the university website at: [http://www.utas.edu.au/students/](http://www.utas.edu.au/students/)

Provider
School of Computing - Faculty of Science, Engineering, and Technology.

OVERVIEW

Introduction
The objectives of this unit are to present the basic principles of writing software for embedded systems. The unit will start by introducing the concept of an embedded system from a hardware perspective covering the important aspects that a software designer should be aware of. From there, the unit will look at: development methods, software architectures, interrupts, real time operating systems, and the principles and practise of developing a working system. The unit will combine theory with practical exercises and the assessment will be based around student research, presentation and practical work.

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

1. Explain the important characteristics of an embedded system that differentiate it from other computing systems
2. Demonstrate an understanding of the architecture and design issues for embedded systems
3. Demonstrate an understanding of real time programming issues
4. Develop simple embedded applications using the OOPIC microcontroller
5. Discuss current industry and research issues associated with embedded systems development
6. Discuss current embedded system technologies
A brief summary of the areas looked at:

- Introduction and examples of embedded systems.
- Distinguishing features of embedded hardware.
- Distinguishing features of embedded software.
- Embedded systems development tools.
- The OOPIC microcontroller and its IDE.
- Basic Embedded Software Engineering
- Time-triggered operation of embedded systems.
- Real time operating systems.
- Testing and debugging.

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

The university has defined a set of generic graduate attributes expected in its graduates. [http://www.utas.edu.au/policy/subject.html#graduates](http://www.utas.edu.au/policy/subject.html#graduates) 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, unless otherwise notified by the unit coordinator
- prepare for, and actively participate in lectures
- 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.utas.edu.au/tl/policies/codes.html](http://www.utas.edu.au/tl/policies/codes.html)

#### Schedule
See the 'Schedule' section on the unit website.

### Teaching and Support Staff

#### Teaching Staff

**Unit Coordinator:**

Dr. Dan Rolf and Dr. Waheed Hugrass  
E-Mail: Daniel.Rolf@utas.edu.au  
Phone: (03) 6324 3450  
Room: V169, Newnham Campus, Launceston

**Lecturing Staff**

Dr. Waheed Hugrass  
E-Mail: Waheed.Hugrass@utas.edu.au  
Phone: (03) 6324 3993  
Room: V167, Newnham Campus, Launceston

#### 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.
- **Burnie**: 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**

None

**Readings**

Readings will be introduced on a weekly basis to coincide with the current topic under discussion. Some general books, available in the library, that will act as good reference material are:

- "Programming and customizing the OOPic microcontroller", Dennis Clark, 2003.

**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.

**Computing Facilities**

The School has PC labs (Windows XP), Mac labs (Mac OS-X 10.4), and Networking labs at the Newnham and Sandy Bay campuses. It also maintains 6 Macs (Mac OS-X 10.4) 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.

Part of the unit will involve using the OOPic microcontroller board and various sensors. This will require the use of a PC with the OOPic IDE (to develop the code) and serial link to copy the code to the OOPic. The necessary software will be available in the PC labs and, also, in the Networks lab.

**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](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/](http://www.admin.utas.edu.au/hr/ohs/pol_proc/)

### ASSESSMENT

#### Item 1
**Title:** Class discussion topics.
**Type:** In-Semester - individual assignment
**Weighting:** 15%
**Due:** Week 5

Due dates will be negotiated in week 1 and revisited as semester progresses. Students will research a topic and present their results in class.

#### Item 2
**Title:** Practicals
**Type:** In-Semester - learning tasks
**Weighting:** 25%
**Due:** Week 12

A series of practical exercises will be set and assessed in an ongoing manner. Due dates will be negotiated in week 1.

#### Item 3
**Title:** Assignment
**Type:** In-Semester - individual assignment
**Weighting:** 20%
**Due:** End of week 13

Due dates will be negotiated in week 1 and revisited as semester progresses.

#### Item 4
**Title:** Design Project
**Type:** In-Semester - group project
**Weighting:** 40%
**Due:** End of week 13

Assessed work will be a mixture of group work and individual items.

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.

### 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](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 and Penalties**

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

**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

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