Course Outline

COMP4601
Design Project B
Semester 1 2013

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Course Staff

Contact Details

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Consultations

Please email me to arrange a suitable meeting time.

Course Details

Course Code:	COMP4601
Course Title:	Design Project B
Units of Credit:	6
Course WebSite:	http://www.cse.unsw.edu.au/~cs4601/
Handbook Entry:	http://www.handbook.unsw.edu.au/undergraduate/courses/2013/COMP4601.html

Course Summary

COMP4601 is a team-based project development course involving the design and implementation of embedded and high performance or low power systems using FPGAs.

In 2013, teams may develop a solution to one of a choice of two project problems. The choices are:

1. To improve the quality of life for the recipients of a vision prosthesis as envisaged by Bionic Vision Australia. The project involves developing a video streaming system and implementing a video processing algorithm to improve visual processing of some everyday activity for a vision-impaired patient.
2. To develop and implement an FPGA-based Blokus Duo game player as outlined for the 2013 ICFPT Design Competition. The project involves encoding a suitable player strategy in hardware to satisfy the requirements of the competition.

Project teams are expected to investigate possible approaches, develop their proposal, implement their design, present their solution, and to report on their implementation and experiences.

Lectures will be provided in part to guide the design of the project solution and to provide the context within which configurable logic design is undertaken. Lectures will cover:

- motivations for hardware-based computer vision,
- video formats and video conversion,
- overview of FPGA-based systems and technology,
- FPGA-based computing techniques,
- implementing configurable systems, and

- case studies of configurable image processing systems.

Course Aims

This course aims to introduce students to the design and implementation of digital systems using configurable hardware. Students will work in teams to develop an FPGA-based solution to a compute intensive or low-power problem. The course aims to provide an understanding of the usefulness and limitations of custom logic as an alternative to processor-based computing.

Student Learning Outcomes

By the end of this course, students should be able to:

- design and implement digital systems using configurable logic,
- be able to distinguish when processor-based and logic-based solutions to computing problems are called for,
- explain and put into practice techniques for accelerating computation in hardware,
- independently study advanced techniques in digital design and implementation, and
- document and present their developments in a professional manner.

This course contributes to the development of the following graduate attributes:

Graduate Attribute	Where Acquired
an in-depth engagement with relevant disciplinary knowledge in its interdisciplinary context	Design & implementation tasks
the capacity for enterprise, initiative and creativity	Design & implementation tasks
the skills required for collaborative and multidisciplinary work	Team activities
the skills of effective communication	Presentation & documentation tasks

Assumed Knowledge

The formal pre-requisites for this course are COMP3211 and COMP3601.

It is assumed that, prior to taking this course, students:

- know how to program an FPGA,
- know how to construct combinational and sequential digital circuits,
- have the background to design architectural solutions to computational problems, and
- understand the concepts of sequential programming i.e. be familiar with the Von Neumann model of sequential computation and know an imperative programming language such as C.

Teaching Rationale

Hardware design and systems prototyping using field-programmable gate arrays is increasingly important and supports a booming embedded systems industry. In order to develop essential skills and to be industrially relevant, Computer Engineering students need to gain experience designing and implementing systems and components using programmable logic devices. The background necessary to understand the design problem and programmable logic technology will be outlined in classes. Students will work in teams to study and develop solutions using current methodologies to a computationally demanding and relevant problem.

Teaching Strategies

Formally, the course comprises two + one lecture hours and two lab hours per week. However, since this is a project course, there will be an emphasis on working informally with your team members to design solutions to the given problem.

Topics on configurable hardware and computing, and topics relevant to the project design, will be introduced and discussed during lectures. Attendance, particularly during the Tuesday lecture time, is expected.

Teams will develop a Project Plan to be submitted at the end of Week 3. The lecturer will provide feedback to each team on their plans.

The lecturer will meet with each group during their usual lab session in Week 6 to review progress on the project implementation. Attendance at these meetings by all team members is compulsory.

Teams will demonstrate the basic system requirement (video streaming/legal Blokus Duo move player) during Week 10. This is a major progress review. Attendance by all team members is required. Teams will have the opportunity to correct problems and re-demonstrate their system during Week 13 based on feedback given at this review.

A final presentation, demonstration and report of the "enhanced" video processing system or a Blokus Duo player that encodes beneficial strategies will be made during Week 13. Teams members will also undertake a reflective exercise and individually review their experiences with the lecturer this week.

Given the complexity of teaching a group of students with diverse backgrounds and different projects, the lecturer may revise or take detours from the plans stated in this Course Outline in order to better achieve the course objectives.

Assessment

Assessment in this course will be based on the following team-based components:

- Week 3 Project Plan report (15%),
- Week 6 Progress Review (15%),
- Week 10 Demo video streaming or legal player functionality (15%),
- Week 13 Presentation (15%),
- Week 13 Demo enhanced video processing or strategic play (15%), and
- Week 13 Technical report (25%).

These will contribute 80% to your course mark.

Individual assessments (20% of your course mark) will be based on individual efforts made to contribute to team successes, your learning, and ability to adapt to circumstances. All students will be required to complete a reflective questionnaire and to be interviewed during Week 13.

Academic Honesty and Plagiarism

Plagiarism is defined as "using the words or ideas of others and presenting them as your own". UNSW and CSE treat plagiarism as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources to help you understand what plagiarism is and how it is dealt with at UNSW:

- Learning Centre: Plagiarism and Academic Integrity
- MyUNSW: Plagiarism and Academic Misconduct
- CSE: Addendum to UNSW Plagiarism Guidelines
- CSE: Yellow Form (whose terms you have agreed to)

Make sure that you read and understand these. Ignorance is not accepted as an excuse for plagiarism.

Course Schedule

The 2013 COMP4601 Course will cover similar topics to those covered during 2012 - see the 12s1 COMP4601 Course Website for an outline of the topics covered.

With a change of focus in 2013 to two projects of quite a different nature, there will necessarily be some alterations in the way in which topics will be covered - in timing, in scope, and in depth.

Resources for Students

There is no prescribed text for this course. However, students will need to refer to product data sheets, standards, system documentation, reference books and technical articles to gain the background needed to design and implement the project system. Some of these references will be identified during the course.

Course Evaluation and Development

Student feedback on this course will be obtained via electronic survey (CATEI) at the end of session and will be used to make improvements to the course. Students are encouraged to provide informal feedback during the session and to let the lecturer in charge know of any problems as soon as they arise. Every reasonable effort to address concerns will be made.

In 2012, 7 out of 19 students responded to the CATEI survey. It would be greatly appreciated and extremely useful to have a greater proportion of the class responding this year!

- In response to feedback received last year, the assessment weightings (particularly of the Week 10 Demo) have been rebalanced.
- A number of respondents sought more guidance on marking criteria. I will probably not provide more detail than I generally do, as doing so often has the effect of narrowing the prescription of the requirements and limiting the creativity of students. The lecturer is aware of and takes responsibility for determining and rewarding the efforts of students to explore a topic more deeply and explain their analyses more effectively.
- Some students would like lectures to be more relevant to the project. In this 4th Year course lectures are intended to provide a starting point from which to undertake your own more detailed study of particular

topics as you feel necessary. I would be delighted to help students who seek guidance in researching specific topics in more detail.