Course Outline

COMP4601
Design Project B
Teaching Period 1 2009

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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 problem. The course aims to provide an understanding of the use 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
- determine 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
- 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 COMP3222 and COMP3601.

It is assumed students:

- know how to program an FPGA,
- know how to construct combinational and sequential digital circuits, and
- understand the concepts of sequential programming i.e. know an imperative programming language such as C

prior to taking this course.

Course Staff

Contact Details

	Role	**Email**	**Phone**

Staff Name			
Oliver Diessel	Course Convenor	odiessel at cse.unsw.edu.au	57384
Jorgen Peddersen	Lecturer	jorgenp at cse.unsw.edu.au	57229

Consultations

Please email the relevant staff member 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/2009/COMP4601.html

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 lectures.

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 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 scheduled for the two hour lecture slot from 1-3 pm on Wednesdays in ASBus 115 when necessary. It is anticipated that lectures will primarily be scheduled during the first half of the course. Both lecturers will be involved in delivering the syllabus. Some guest lectures may be arranged. Attendance is highly encouraged.

Design team presentations will occur during the one hour lecture slot scheduled for 1 pm on Thursdays in ASBus 115. Teams will present on a regular basis. Attendance is compulsory.

Your team will be scheduled to have use of the Lyre (ASyst) lab on the Ground Floor of K17 for one of the two two-hour sessions from 9-11 am or 11-1 pm on Fridays. You are welcome to use the lab at other times when it is not being used for another scheduled class and there is an available workstation. However, you are guaranteed space during your scheduled lab session. Lecturing and demonstrating staff will be on hand during your scheduled lab session for consultation and assistance. Attendance is voluntary.

Assessment

Your assessment in this course will be based on the following components:

- **Project Design (50%)** - Marks will be provided based on how well the project has been completed, including progress towards completion of the requirements and adherence to the specifications. The project will be demonstrated for final assessment at a mutually convenient time between the lab session in Week 12 and Friday 26 June.
- **Design Documentation (20%)** - Each student within the team will take a leading role in preparing and delivering one design document from the list below. You may gain the assistance of other team members in this work. Teams of 3 may submit a jointly prepared *Design Report* and must submit the set of individually prepared reports in Week 12.
  - *Initial Design Report* - Describe plans for the system design. This report is due at 5pm on Friday of Week 6. See the report specification for more detail on the assessment criteria.
  - *Implementation Report* - Detail the design of the system as implemented. This report is due at 5pm on Friday of Week 12. See the report specification for more detail on the assessment criteria.
  - *Evaluation Report* - Assess the performance of the system; compare it with a processor-based design.

This report is due at 5pm on Friday of Week 12. See the report specification for more detail on the assessment criteria.
    - *Magazine Article* - Write a descriptive article about the design, implementation and evaluation of your system. This report is due at 5pm on Friday of Week 12. See the report specification for more detail on the assessment criteria.
- **Team Reports (10%)** - Every student will provide the following two short reports:
    - *Initial Team Report* - Students discuss the strengths and weaknesses of their teammates and the proposed task breakdown. The report is due at 5pm on Friday of Week 3. See the report specification for more detail on the assessment criteria.
    - *Final Team Report* - Submitted at the end of course. Students describe and evaluate the contribution of each team member and discuss their relevance to the work done in the project. The report is due at 5pm on the day of your final demo. See the report specification for more detail on the assessment criteria.
- **Meeting Performance (10%)** - Students will present their team's progress on two occasions during the course. Attendance at all presentations is compulsory and forms part of this assessment.
- **Peer Assessment (10%)** - Each student's contributions to the team are rated by the other members of the team.

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 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.

This is the first session in which this course is offered. The experiences of the 08s2 offering of COMP3601 were drawn upon in shaping COMP4601 for this session.

Course Summary

The 2009 project involves the development of a computer vision system. In outline, the project entails:

- converting a PAL video camera stream into RGB for display on a VGA monitor,
- processing the video stream to detect certain objects, and
- using information about the detected objects to control the scene.

The lecture content will be guided by the project requirements and the need to understand how to map algorithmic requirements to the target hardware system.

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