



## Prescription

The course develops an understanding of the structure of Field Programmable Gate Arrays, how to program them and how to interface them to the real world. The topics covered are VHDL programming, logic design, state machine design, I/O, design tools, simulation, timing analysis, debugging, IP block design methodology, softcore microprocessors and system on a chip implementation. Practical experience is gained through the use of professional design tools and hardware to interface FPGAs with the physical world.

## Course learning objectives

Students who pass this course should be able to:

1. Demonstrate the understanding of Field Programmable Gate Array technology, it's internal architecture and interfaces (BE graduate attribute 3(a)).
2. Implement a complex digital circuit in an FPGA using VHDL and higher-level design entry approaches (BE graduate attribute 3(f)).
3. Demonstrate the understanding of Field Programmable Gate Array technology design, implementation and debugging flow (BE graduate attribute 3(a)).
4. Implement a design in an FPGA that includes an embedded softcore microprocessor and a custom hardware block (BE graduate attribute 3(f)).

## Course content

This course is a lab-based course. Labs, tutorials and tests will require in-person attendance by students in the Wellington Region. There will be online options for students outside the Wellington region, but students will have to complete alternative substitutes to the physical lab requirements. The remote option for tests will use a Zoom-based system for online supervision of the tests.

Students taking this course remotely from outside the Wellington region must have access to a computer with camera and microphone and a reliable high speed internet connection that will support real-time video plus audio connections and screen sharing. Students must be able to use Zoom; other communication applications may also be used. A mobile phone connection only is not considered sufficient. The computer must be adequate to support the practical work required by the course: a windows 10 or 11, laptop or desktop computer will be sufficient.

## Withdrawal from Course

Withdrawal dates and process:

<https://www.wgtn.ac.nz/students/study/course-additions-withdrawals>

## Lecturers

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## Dr Robin Dykstra (Coordinator)

robin.dykstra@vuw.ac.nz 04 886 5334

AM 415 Alan Macdiamid Building, Gate 7, Kelburn Parade, Kelburn

## Hamish Colenso

hamish.colenso@vuw.ac.nz 04 463 6523

CO 251 Cotton Building (All Blocks), Gate 7, Kelburn Parade, Kelburn

## Teaching Format

During the trimester there will be one lecture plus a two hour practical tutorial per week. The lab component will consist of eleven lab session of three hours each.

## Student feedback

Student feedback on University courses may be found at: [www.cad.vuw.ac.nz/feedback/feedback\\_display.php](http://www.cad.vuw.ac.nz/feedback/feedback_display.php)

## Dates (trimester, teaching & break dates)

- Teaching: 11 July 2022 - 14 October 2022
- Break: 22 August 2022 - 04 September 2022
- Study period: 17 October 2022 - 20 October 2022
- Exam period: 21 October 2022 - 12 November 2022

## Class Times and Room Numbers

### 11 July 2022 - 21 August 2022

- **Wednesday** 10:00 - 10:50 – 524, Old Kirk, Kelburn

### 05 September 2022 - 16 October 2022

- **Wednesday** 10:00 - 10:50 – 524, Old Kirk, Kelburn

## Other Classes

Tutorial (compulsory, in lab 2 hour practical tutorial): Wednesday 11:00 - 1:00, Cotton 249  
Labs, 3 hours, Monday 2:00 - 5:00, Cotton 249

## Set Texts and Recommended Readings

### Required

There are no required texts for this offering.

## Mandatory Course Requirements

In addition to achieving an overall pass mark of at least 50%, students must:

- Satisfactorily complete at least 80% of the assigned labs, to ensure that students demonstrate the understanding of all the CLOs of the course.

If you believe that exceptional circumstances may prevent you from meeting the mandatory course requirements, contact the Course Coordinator for advice as soon as possible.

## Assessment

This course is internally assessed.

Assessment Item	Due Date or Test Date	CLO(s)	Percentage
2 Tests (1 hour each)	TBC	CLO: 1,2,4	50%
2 Assignments (10 hours each)	TBC	CLO: 1,2,3,4	15%
Laboratory work (done in lab sessions, with additional 1 hours each for write-up)	TBC	CLO: 2,4	35%

## Penalties

Work submitted late will incur a 10% penalty per late day or part thereof. Students expecting to submit work late should use the extension system that is part of the submission system.

## Extensions

Extension procedures for EEEN402 will use the normal Faculty extension process. You need not contact the course lecturers directly for most assignment extensions, but simply follow the procedures within the submission system. If you require extensions beyond that handled automatically then you should contact staff.

## Submission & Return

Submission of assignments and laboratory reports will be through the ECS submission system. Marks and comments will also be returned via the submission system.

## Workload

The student workload for this course is 150 hours.

## Teaching Plan

See: [https://ecs.wgtn.ac.nz/Courses/EEEN402\\_2022T2/LectureSchedule](https://ecs.wgtn.ac.nz/Courses/EEEN402_2022T2/LectureSchedule)

## Communication of Additional Information

The ECS course wiki ([https://ecs.wgtn.ac.nz/Courses/EEEN402\\_2022T2/](https://ecs.wgtn.ac.nz/Courses/EEEN402_2022T2/)) will be the main source of information for the course. Some information, notably video of the lectures and course feedback forms will be available on the Blackboard site.

## Links to General Course Information

- Academic Integrity and Plagiarism: <https://www.wgtn.ac.nz/students/study/exams/integrity-plagiarism>
- Academic Progress: <https://www.wgtn.ac.nz/students/study/progress/academic-progress> (including restrictions and non-engagement)
- Dates and deadlines: <https://www.wgtn.ac.nz/students/study/dates>
- Grades: <https://www.wgtn.ac.nz/students/study/progress/grades>
- Special passes: Refer to the Assessment Handbook, at <https://www.wgtn.ac.nz/documents/policy/staff-policy/assessment-handbook.pdf>
- Statutes and policies, e.g. Student Conduct Statute: <https://www.wgtn.ac.nz/about/governance/strategy>
- Student support: <https://www.wgtn.ac.nz/students/support>
- Students with disabilities: [https://www.wgtn.ac.nz/st\\_services/disability/](https://www.wgtn.ac.nz/st_services/disability/)
- Student Charter: <https://www.wgtn.ac.nz/learning-teaching/learning-partnerships/student-charter>
- Terms and Conditions: <https://www.wgtn.ac.nz/study/apply-enrol/terms-conditions/student-contract>
- Turnitin: <http://www.cad.vuw.ac.nz/wiki/index.php/Turnitin>
- University structure: <https://www.wgtn.ac.nz/about/governance/structure>
- VUWSA: <http://www.vuwsa.org.nz>

**Offering CRN:** [34014](#)

**Points:** 15

**Prerequisites:** EEEN 301 (or ECEN 301)

**Restrictions:** ECEN 302

**Duration:** 11 July 2022 - 13 November 2022

**Starts:** Trimester 2

**Campus:** Kelburn