RUTGERS UNIVERSITY
School of Engineering
Department of Electrical & Computer Engineering

332:233 – Digital Logic Design Laboratory – Fall 2022

Course Description:

This bi-weekly laboratory course is a co-requisite to the 332:231 Digital Logic Design course. Students are expected to register for both courses in the same semester.

The lab course is administered *online* using the Emona net-circuit-labs FPGA board. Students may log into that board from a browser at the following website using their RU NetID as *username* and their 9-digit student number as *password:*

http://ece-emona1.engr.rutgers.edu/

If you are unable to log in, it may be that your name needs to be added to the board's roster. Please contact the ECE Lab Administrator, Mr. Kevin Wine, at kevin.wine@rutgers.edu.

Two introductory tutorial videos on using the Emona board are available on Canvas Files, as well as an introductory manual in PDF.

In addition to the Emona board, the DLD lab also has a small MATLAB component. MATLAB is freely available to Rutgers students. Several MATLAB tutorials are posted under Canvas Files. A tutorial video on using Simulink specifically for DLD is available on Canvas Files.

There are six lab experiments to be carried out on the Emona board and/or MATLAB which include, but are not limited to, the following topics:

1. Introduction to the Emona board, and implementation of simple logic gate circuits.
2. Logic gate simplifications using Karnaugh maps, timing diagrams, and timing hazards.
3. Implementation of Gray code circuits using XOR gates.
4. Digital comparators, arithmetic circuits, half-adders and full-adders.
5. Latches, flip-flops, and sequential circuits.
6. Shift registers, counters, and finite state machines.

Prerequisites:

listed in: https://www.ece.rutgers.edu/undergraduate-course-descriptions

co-requisite: DLD 332:231

Lab Organization:

Each lab assignment will be posted on Canvas Assignments with specific instructions on what experiments to carry out and how to structure the lab report.

Lab reports are to be submitted within their due dates on Canvas Assignments. Lab reports will not be accepted past their due date.

Because the Emona board can only accommodate about 50 students at the same time, the six lab sections are allowed to use the board *only* at the reserved scheduled times listed below:

```
Section 1 - index 12970 - M  02:00 - 05:00 pm
Section 2 - index 12971 - W  08:30 - 11:30 am
Section 3 - index 12972 - T  08:30 - 11:30 am
Section 4 - index 12973 - T  03:50 - 06:50 pm
Section 5 - index 12974 - W  12:10 - 03:30 pm
Section 6 - index 12975 - Th 05:40 - 08:40 pm
```

Labs will begin in the week of **Sept. 12, 2022**.

Lab Guidelines:

Please adhere to the following guidelines in carrying out the labs and preparing the lab reports. These guidelines will be strictly observed.

Students need to take *two screenshots* of each circuit built on the Emona board: (i) one screenshot that will be saved on the board under their account, using the *capture* button on the board, and (ii) another screenshot taken with the screenshot tool of their PC, e.g., snipping tool in Windows, and saved as a JPG or PNG file and embedded into their report file. An example of such screenshot is attached at the end of this syllabus.

For lab reports to be acceptable, the *time-stamps* of the submitted experiment *screenshots* must fall within the allowed reserved working times of *your* section as listed above.

With the exception of the above reserved times for taking screenshots, the board can be used at any other time during the week for preliminary work and design – as you work on your circuit, please remember to keep saving your configuration under your Emona account.

Important: The time stamps of your screenshots must fall within the reserved working times of *your* section. Moreover, the time stamps and *your userid* must be *clearly visible* at the top of your screenshots – otherwise, your reports will not be accepted.

The captured/saved screenshots under your Emona account must not be deleted before the grading cycle of each lab is completed (about 3 weeks after each lab).

Lab reports must be submitted as Word doc files, or converted to PDF, or using LaTeX and converted to PDF. Moreover, to be accepted all reports must contain the following *"Declaration of Authorship"*, signed and dated by you:

Declaration of Authorship

I declare that this lab report is my own and has been generated by me as the result of my own work.

I confirm that I have acknowledged all main sources of help and, where I have consulted with others, this is always clearly attributed, including consultations with my TAs or classmates.

I have provided the sources or references of all materials included in this report that were taken from other works, including online materials, such as pictures, graphs, diagrams, screenshots, and text quotes.

Moreover, I affirm that I have not let my classmates or other persons copy materials from this report for their own use.

Name & Date:

The Word file, **lab-template.doc**, and the LaTeX file, **lab-template.tex**, posted on Canvas Files, may be used as a templates for the lab reports. They includes a cover page and the above declaration (which you must sign and date – simply typing your name is OK).

Instructor:

Sophocles J. Orfanidis
Room EE-230, Tel. 848-445-5017,
email: `orfanidi@rutgers.edu`

TAs:

Zahra Aref	`zahra.aref@rutgers.edu`
Lingyi Huang	`lingyi.huang@rutgers.edu`
Huy Phan	`huy.phan@rutgers.edu`
Zhongze Tang	`zhongze.tang@rutgers.edu`
Zichen Zhu	`zichen.zhu@rutgers.edu`

The recitation and lab sections will be rotating each week across the TAs. Students are encouraged to send their questions by email to any of the TAs or Prof. Orfanidis.

Academic Integrity:

It is taken for granted that students *accept and adhere* to the Rutgers academic integrity policy described in:

`http://academicintegrity.rutgers.edu/`

Please read also the IEEE code of ethics that should guide your professional life:

`https://www.ieee.org/about/corporate/governance/p7-8.html`

Students with Disabilities:

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability *must contact* the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you and your instructors with a Letter of Accommodations. To begin this process, please complete the Registration form on the ODS web site at:

`https://ods.rutgers.edu`
`https://ods.rutgers.edu/students/getting-registered`
`https://ods.rutgers.edu/students/documentation-guidelines`

your user ID must be clearly visible

captured screenshots must:
(a) reside in your Emona account,
(b) must be embedded in your report

date/time must be clearly visible