ECEN1011 Digital Systems

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Course Description

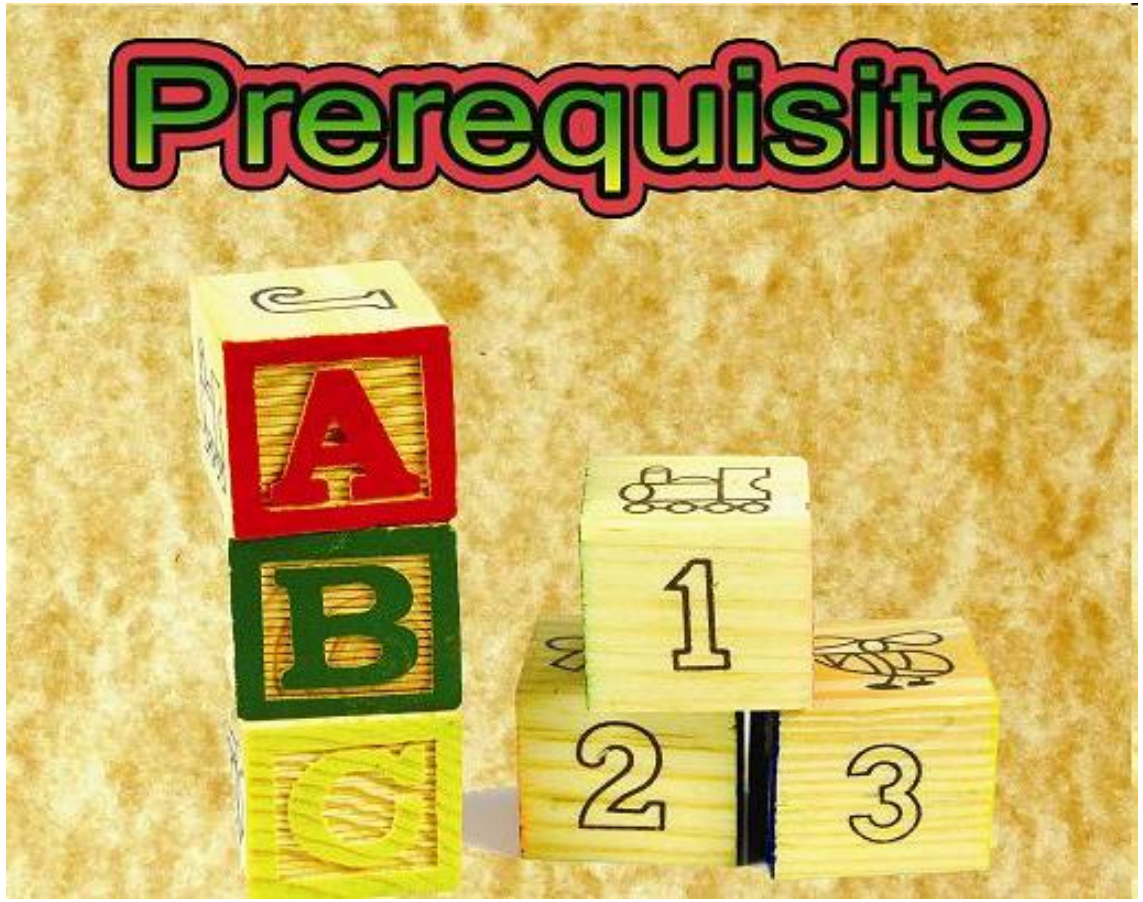
This course introduces digital logic design basics, which are fundamental to all computers and other digital hardware. Number systems, Boolean algebra, and analysis and design of combinational and sequential circuits are covered. Practical design techniques along with theory and principles will be taught, with paper-pencil design techniques as well as computer aided design.

Course Objectives

- Apply Boolean algebra and other techniques to express and simplify logic expressions.
- Analyze and design combinational and sequential digital systems.
- Use hardware description language and CAD tool to design and simulate digital systems.

Prerequisites

- Course
  - None
- Knowledge
  - Fundamental knowledge about computer
  - Basic Programming
  - Voltage, Current, …
- Abilities
  - Self-study
  - Hard working
  - Doing and Designing Experiments



Topics Covered

- Number systems and conversion
- Boolean algebra
- Analysis & design of combinational digital systems
- Analysis & design of sequential digital systems
- State machines
- HDL, FPGA/CPLD based digital system design

Assessment

- Labs: 25%
- Project (Case Study): 15%
- Quiz: 10%
- Mid-term Test: 10%
- Final Exam.: 40%

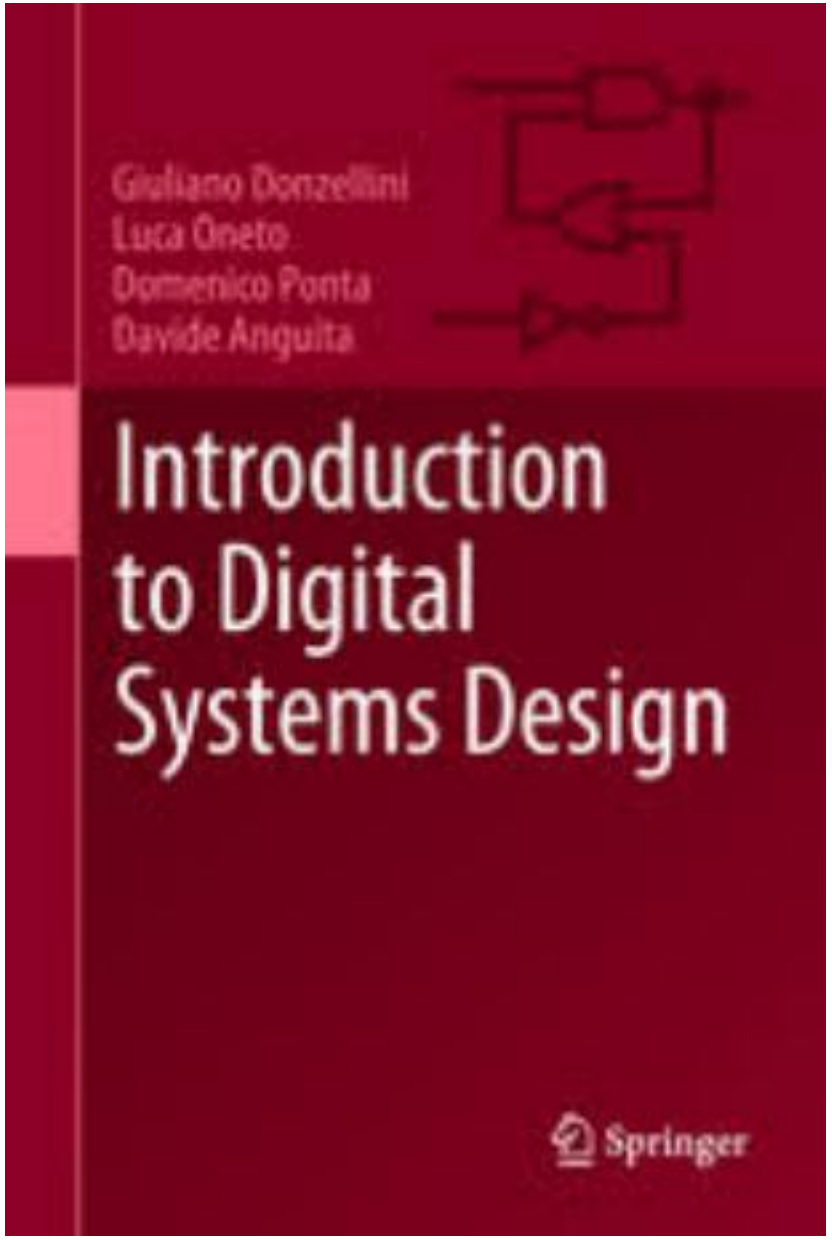
- For Lab and Project Report submission
  - A 10% deduction will be applied for every 0-24 hours late submission.
  - Submission must be made before the final examination.
  - Each student is required to submit individual reports.

Main References

- G. Donzellini, L. Oneto, D. Ponta, D. Anguita, ***Introduction to Digital Systems Design***, Springer, (c) 2019

  https://www.springer.com/it/book/9783319928036

  (free download through Intranet)

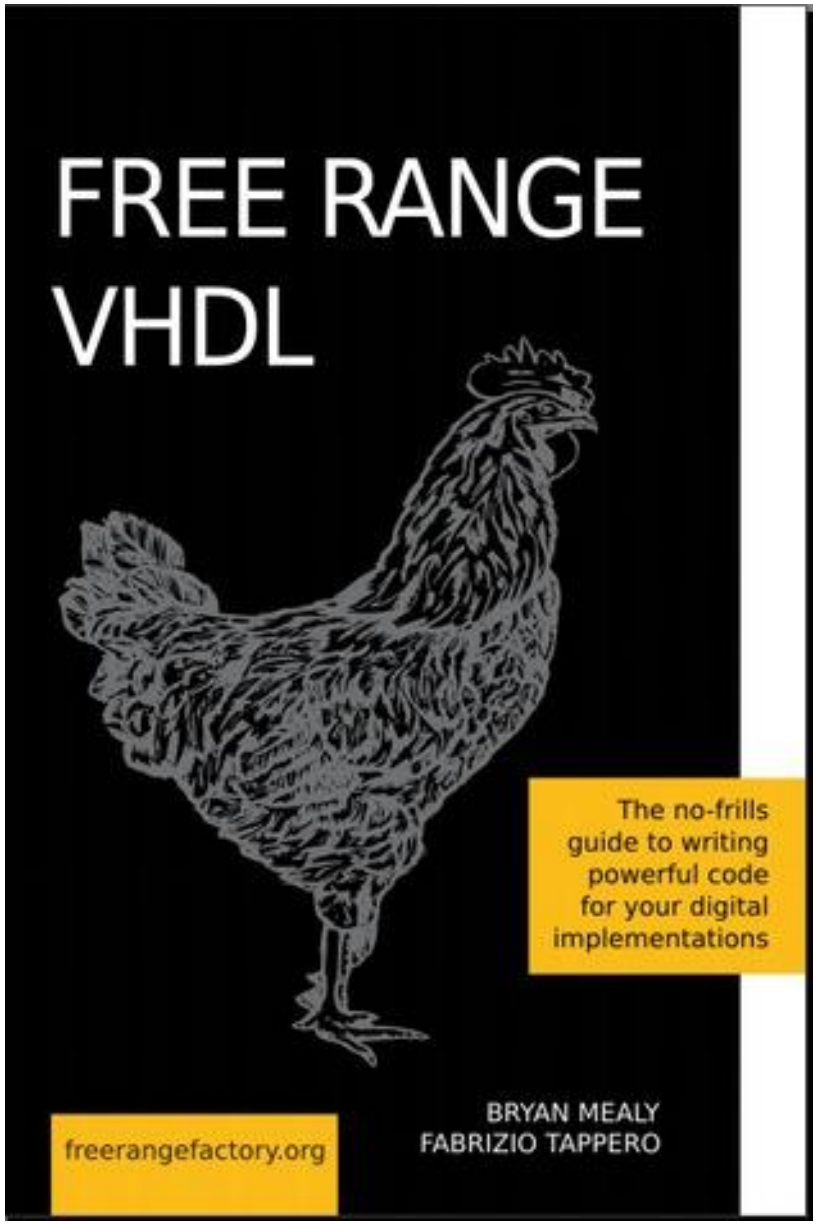


Other References

- Bryan Mealy, Fabrizio Tappero, ***Free Range VHDL***, 2018

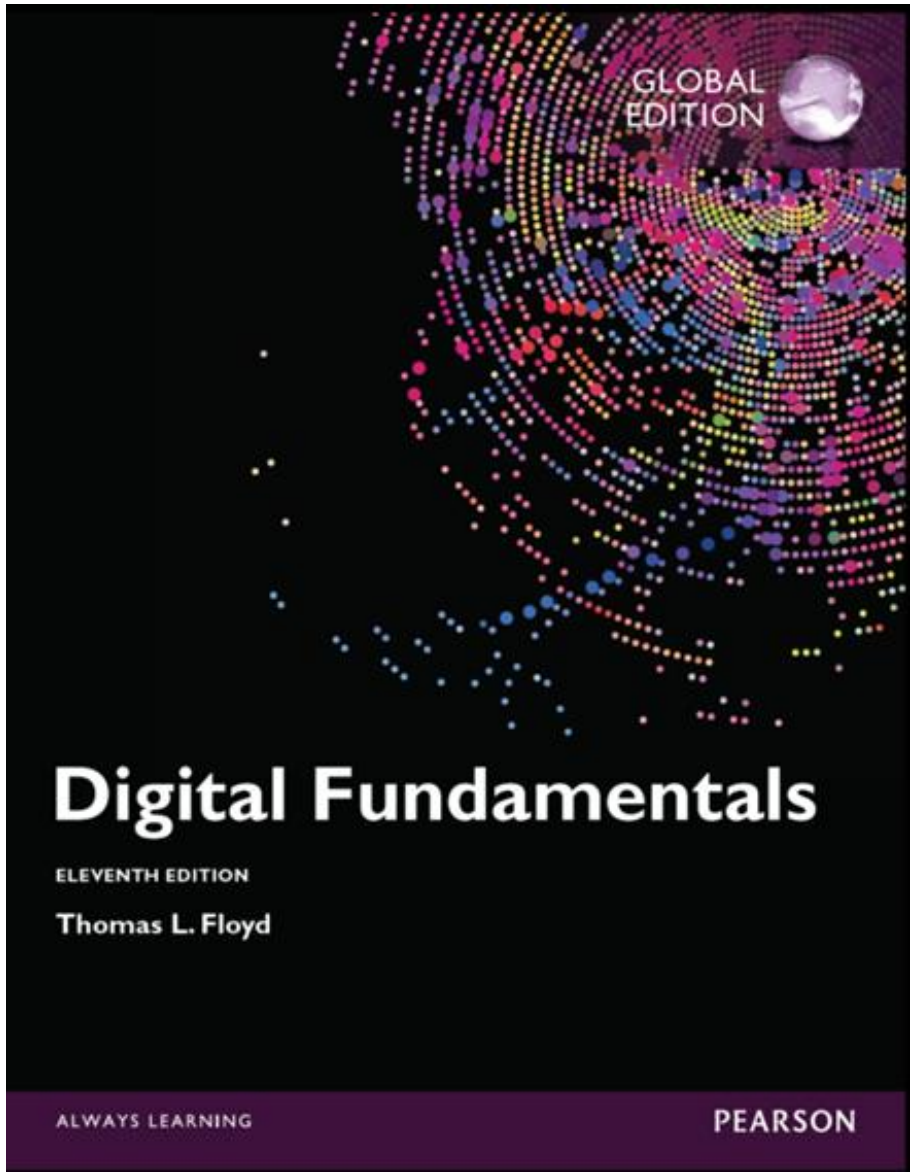
  https://freecomputerbooks.com/Free-Range-VHDL.html

  (free download)



Other References

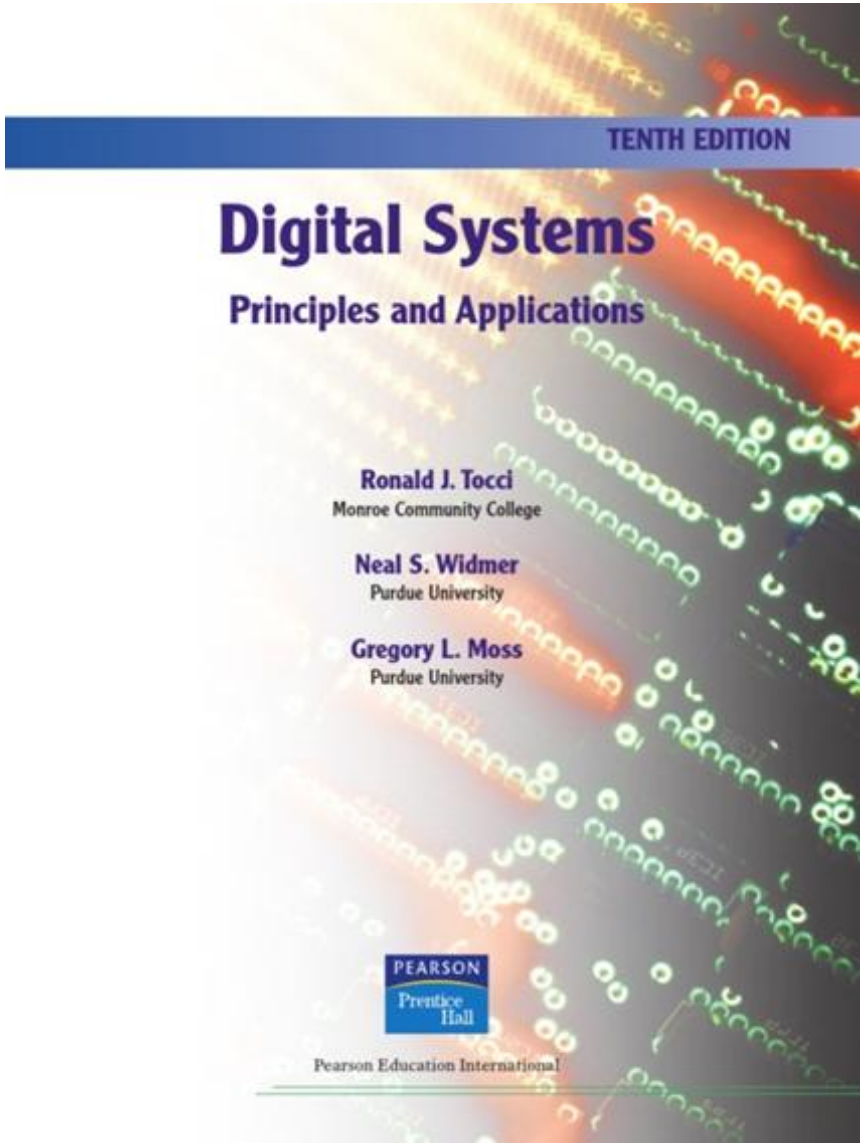
- Thomas L. Floyd, ***Digital Fundamentals***, 11th Edition, Pearson/Prentice Hall



Other References

- Ronald J. Tocci, Neal Widmer and Greg Moss, ***Digital Systems: Principles and Applications***, Pearson/Prentice Hall

  https://eceatglance.wordpress.com/wp-content/uploads/2018/07/digital-systems-principles-and-applications-10th-edition-tocci-widmer.pdf



Reference Web Sites

- Digital Electronics Deeds
  https://www.digitalelectronicsdeeds.com/index.html
- FPGAs For Dummies
  https://freecomputerbooks.com/FPGA-for-Dummies.html
  https://wiki.stepfpga.com/_media/fpgasfordummiesebook.pdf
- EDA Playground
  https://eda-playground.readthedocs.io/en/latest/tutorial.html
  https://www.youtube.com/user/edaplayground
- Digital Electronics
  https://www.youtube.com/watch?v=M0mx8S05v60&list=PLBlnK6fEyqRjMH3mWf6kwqiTbT798eAOm

Simulator Software (used in class)

- **Deeds Simulator (for windows)**
  https://www.digitalelectronicsdeeds.com/deeds.html

- **EDA Playground (VHDL online simulator, web based)**
  https://www.edaplayground.com