

Digital electronics



EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research,
Development and Education



The Study of Modern and Developing Engineering BUT
CZ.02.2.69/0.0/0.0/18_056/0013325

The repository contains VHDL lab exercises for bachelor course *Digital Electronics* at Brno University of Technology, Czechia.

Exercises

EDA Playground

1. [Introduction to Git and VHDL](#)
2. [Combinational logic](#)

Vivado

3. [Introduction to Vivado](#)
4. [Seven-segment display decoder](#)
5. [Binary counter](#)
6. [Driver for multiple seven-segment displays](#)
7. [Latches and Flip-flops](#)
8. [Stopwatch](#)
9. [Traffic light controller](#)

VHDL project

9.-13. [General instructions](#)

Materials

The following hardware and software components are mainly used in the lab.

Hardware

- Nexys A7 Artix-7 FPGA Trainer Board: [reference manual](#), [schematic](#), XC7A50T-1CSG324C [FPGA](#), [Nexys-A7-50T-Master.xdc](#)
- Oscilloscope Keysight Technologies [DSOX3034T](#) (350 MHz, 4 analog channels), including 16 logic timing channels [DSOXT3MSO](#) and serial protocol triggering and decode options [D3000BDLA](#)

Software

- [EDA Playground](#)
- [Vivado Design Suite 2020.1: installation](#)
- [git](#)

References

1. [ES 4 VHDL reference sheet](#)
2. [Digital electronics 1 wiki](#)
3. ASHENDEN, Peter J. *The designer's guide to VHDL*. 3rd ed. Boston: Morgan Kaufmann Publishers, c2008. ISBN 978-0-12-088785-9.
4. CHU, Pong P. *FPGA prototyping by VHDL examples*. Hoboken, N.J.: Wiley-Interscience, c2008. ISBN 978-0-470-18531-5.
5. MANO, M. Morris. *Digital Design: With an Introduction to the Verilog, HDL, VHDL, and System Verilog*. Pearson, 6th edition, 2018. ISBN-13: 978-1292231167.
6. KALLSTROM, P. [A Fairly Small VHDL Guide](#). Version 2.1.
7. [GitHub GIT CHEAT SHEET](#)