COURSE	Name	:	Design Using Programmable Device
	Code	:	EE184643
	Credits	:	3
	Semester	:	VI

Description of Course

This course studies the implementation of digital circuits and systems using programmable hardware components of FPGA, which also include design procedures using HDL (Hardware Description Language) such as VHDL or Verilog, and the use of EDA tools for designing. Implementation includes design of combinational circuits, sequential circuits, FSM, DSP, digital filter circuit, and microprocessor design.

Learning Outcomes

Knowledge

(P03) Mastering the concepts and principles of design procedure in power systems, control systems, multimedia telecommunications, or electronics.

Specific Skill

(KK02) Able to describe the completion of engineering problems in power systems, control systems, multimedia telecommunications, or electronics.

(KK03) Able to describe system design for problem solving in power systems, control systems, multimedia telecommunications, or electronics by concerning technical standards, performace aspect, reliability, ease of application, and assurance of sustainability.

General Skill

(KU01)Able to apply logical, critical, systematic and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise.

(KU08) Able to conduct self-evaluation process to work group under his/her responsibility, and able to manage learning independently.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering digital circuits and systems for design and classification techniques, evolution of programmable H/W components, internal architecture of programmable H/W components such as PLD and FPGA and their respective advantages and disadvantages.

Specific Skill

Able to master the design stage of digital system based on H/W programmable ranging from the desired specification stage to testing stage, able to designa simple digital system based H/W programmable with the correct methodology, and able to understand the verification techniques and their usage.

General Skill

Able to understand the EDA tools as well as their usage, such as Quartus II for Altera FPGA and Xilinx ISE

Able to design a digital system and implement in FPGA

Attitude

Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Main Subjects

1. Digital System: Combinational, Sequential, Controller, Data Path, Finite State Machine (FSM)
2. Evolution and Architecture of Programmed Hardware components: PROM, PAL, PLA, Masked Gate Array, FPGA
3. EDA Tools (Quartus Altera or Xilinx ISE): Editing, Test bench, Synthesis, Place and route, Programming tools
4. Technical design using HDL (VHDL or verilog), including Specification, component selection, system design, entity creation and architecture with logical/Boolean equation method, data flow and behavioral, verification: Simulation, Timing analysis, implementation and testing
5. Implementation of Combinational and Sequential Circuits of programmable component design into FPGA
6. Digital System Implementation and digital signal processing (Digital Filter) programmable component design into FPGA
7. Implementation of microprocessor (Control unit, datapath and memory) design of programmable components into FPGA

Reference(s)

[1] MBob Zeidman, Designing with FPGAs and CPLDs, Elsevier, 2002
[2] Kevin Skahill, VHDL for Programmable Logic, Addison Wesley, 1996
[3] S. Brown and Z. Vranesic: Fundamentals of Digital Logic and VHDL Design, 3rd Edition McGraw-Hill, 2009.
[4] Enoch O. Hwang, Digital Logic andMicroprocessor Design with VHDL, CL-Engineering, 2006 atau 2016 yang terbaru.
[5] M. Morris Mano and Charles R. Kimme, Logic and Computer Design Fundamentals, 4th edition, Pearson Prentice Hall, 2008.

Prerequisite(s)

EE184401 Digital and Microprocessor Systems