

TECHNOLOGY 473 - Advanced Digital Design

2007-08 Catalog Data: TECH 473 Advanced Digital Design (3 Credits)

Course Catalog Description: Advanced digital design approaches using VHDL and Field Programmable Gate Arrays (FPGA). Topics include firmware-based digital design, circuit prototyping, testing, simulation and implementation using XILINX modeling and synthesis platform.

Prerequisite: TECH 377-Microprocessors & Interfacing and TECH 377A.

Textbook:

- Sudhakar Yalamanchili, *Introductory VHDL from simulation to Synthesis*, Prentice-Hall, 2001.

References:

- P. K. Chen and S. Mourad, *Digital System Design Using Field Programmable Gate Arrays*, Prentice-Hall, 1994.
- M. Treseler, *Designing State Machine Controllers Using Programmable Logic*, Prentice-Hall, 1991.

Instructor: Dr. Abul K. M. Azad

Office: Still Hall 203D

Phone: (815) 753-0386; Email: azad@ceet.niu.edu

Objectives with relationship to ABET Outcomes:

1. Understanding of various approaches of advanced digital design processes. (A, B, and I)
2. Understanding and use of VHDL design methods through behavioral and data flow approaches. (A, B, C, D, F, and M)
3. Use the XILINX Foundation Series Software tools for VHDL design, synthesis and simulation. (B, C, D, E, F, G, I, M, and N)
4. Design and prototyping of digital system using FPGA (Field Programmable Gate Array). (B, C, D, E, F, G, I, L, M, and N)

Course Outcome Guideline:

- A. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
- B. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology.
- C. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.

- D. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
- E. An ability to function effectively on teams.
- F. An ability to identify, analyze and solve technical problems.
- G. An ability to communicate effectively in writing.
- H. An ability to communicate effectively orally.
- I. Recognition of the need for, and an ability to engage in lifelong learning.
- J. An ability to understand professional, ethical and social responsibilities.
- K. A respect for diversity and knowledge of contemporary professional, societal and global issues.
- L. A commitment to quality, timeliness, and continuous improvement.
- M. An ability to program computers and/or utilize computer applications effectively.
- N. An ability to use modern laboratory techniques, skills, and/or equipment effectively.

Topics

1. Introduction to programmable logic devices
2. VHDL design techniques
3. FPGA Based Digital Logic Design
4. Combinational Logic Control Application
5. Modular Design and Module Replication
6. Hierarchical Design

Computer Usage: Students will make use of computer for VHDL programming and downloading the assembled program to the target board (Spatran FPGA board). For laboratory report preparation word processor need to be used.

Laboratory Projects: There are laboratory sessions incorporated within the course itself. The amounts of topics covered through this course are equally distributed between the teaching and laboratory sessions.

Laboratory Groups: Choose your laboratory group partner at the very beginning of the course. This group arrangement needs to be maintained throughout the course to maximize the learning process

Evaluation: The grading will be based on the following percentages

Attendance	5% (required minimum 80% of attendance to get any mark under this criteria)
------------	---

Incourse Exam-1	25%
Incourse Exam-2	25%
Lab Projects	45%

Grading Criteria:

Marks obtained	Grade
100 - 90%	A
89% - 80%	B
79% - 70%	C
69% - 60%	D

Attendance:

Attendance will be recorded in every class. Late arrival in the class will not be allowed. If a student is absent it is his/her responsibility to obtain lecture notes, homework, and any other information given during that absence.

Homeworks and other assignments:

Completed homeworks and project reports need to be handed in “*on or before*” the due date (printed copy only). Any late submission will not be accepted.

Academic Misconduct:

This is usually defined as “*Receipt or transmission of unauthorized aid on homeworks or examinations, plagiarism, unauthorized use of examination materials, or other forms of dishonesty in academic matters.*” Misconduct may also include inappropriate or disruptive behavior during the class meetings. This will NOT be tolerated and would affect your grade. For details please consult your student handbook.

Receiving Assistance:

If you have any question(s) related to academic matters and/or anything else, which effecting your performance in this class please don’t hesitate to contact the course teacher without any delay.

Classroom Practices:

1. Raise your hand if you have any question(s).
2. Before entering the classroom, switch off all the cell phones and pagers (and any other electronic items, which may disrupt the class).
3. No side conversations or any other readings during the class.
4. Report for any planned early departure.