Digital Design using VHDL (EE 470)  
Course Syllabus  
Fall 2015

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Prerequisite: EE321

Course Description: This course instructs the students in the use of VHDL ((Very High Speed Integrated Circuit Hardware Description Language) for describing the behavior of digital systems. VHDL is a standardized design language used in computer/ semiconductor industry. This course will teach students the use of the VHDL language for representation of digital signals, use of IEEE standard logic package/library, design description, design of arithmetic, combinational, and synchronous sequential circuits.


Objectives:

1. Students must demonstrate the use and application of Boolean Algebra in the areas of digital circuit reduction, expansion, and factoring.

2. Students must learn the IEEE Standard 1076 VHDL Hardware Description Language

3. Students must be able to simulate and debug digital systems described in VHDL

4. Students must be able to synthesize complex digital circuits at several level of abstractions;

5. Students must be able to implement logic on an FPGA and a CPLD

Prerequisites: Students must demonstrate a working knowledge of digital logic and design techniques and have a working knowledge of digital design including synthesis of finite state machines. Specific course pre requisite is CS320/EE 321 (Digital Logic).

Course Outline: Each of the following topics will be covered in this course:

- Introduction and course overview (Week 1)
- The Design Process (Week 1)
- Design Descriptions and CAD Tools (Week 1)
- System Design Concepts (Week 1)
- Review of Transistors and PLD devices (Week 2 and 3)
- Implementation of Logic Functions (Weeks 3 and 4)
- Test I (Week 5)
- Arithmetic Circuits (Week 6 and 7)
- Building Block Approach for Combinational Circuits (Week 8 and 9)
- Test II (Week 10)
- Registers and Counters (Weeks 11 and 12)
- Synchronous Sequential Circuits (Weeks 13 and 14)
- Synthesis using VHDL (Week 15)
- Test III (Week 16)

**Evaluation:**
- Homework 10 %,
- Test I 30 %,
- Test II 30 %,
- Test III 30 %

**Grades:** A (100-90), B (89-80), C (79-70), D (69-60), F (59-0)

**ABET Outcome Coverage:**

<table>
<thead>
<tr>
<th>Outcome-related course learning objective</th>
<th>ABET 3a</th>
<th>ABET 3e</th>
<th>ABET 3i</th>
<th>ABET 3k</th>
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</thead>
<tbody>
<tr>
<td>(i) demonstrate the use and application of Boolean Algebra in reduction, expansion, factoring</td>
<td>2</td>
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<td>(ii) use commercially available VHDL software to analyze and synthesize digital circuits</td>
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<td>(iii) Be able to simulate and debug digital systems described in VHDL</td>
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<tr>
<td>(iv) to synthesize complex digital circuits at several level of abstractions</td>
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<tr>
<td>(v) to implement logic on an FPGA and a CPLD</td>
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(1=objective addresses outcome slightly, 2=moderately, 3=substantively)

- (3a) Ability to apply knowledge of mathematics, science, and engineering
- (3e) Ability to identify, formulate, and solve engineering problems.
- (3i) Recognition of the need for, and an ability to engage in lifelong learning.
- (3k) Ability to use techniques, skills, and modern engineering tools necessary for engineering practice

**Disability Accommodation**
Students with disabilities may request reasonable accommodations through the A&M-Texarkana Disability Services Office by contacting Carl Greig, Aikin room 219A or by calling 903.223.3062.
Academic Dishonesty
Academic honesty is expected of students enrolled in this course. Cheating on examinations, unauthorized collaboration, falsification of research data, plagiarism, and undocumented use of materials from any source, constitute academic dishonesty, and may be grounds for a grade of "F" in the course and/or disciplinary actions." For additional information see the university policy manual.

Statement on email usage
Upon application to Texas A&M University-Texarkana an individual will be assigned an A&M-Texarkana email account. This email account will be used to deliver official university correspondence. Each individual is responsible for information sent and received via the university email account and is expected to check the official A&M-Texarkana email account on a frequent and consistent basis. Faculty and students are required to utilize the university email account when communicating about coursework.

Drop Policy
To drop this course after the census date (see semester calendar), a student must complete the Drop/Withdrawal Request Form, located on the University website http://tamut.edu/Registrar/droppingwithdrawing-from-classes.html or obtained in the Registrar’s Office. The student must submit the signed and completed form to the instructor of each course indicated on the form to be dropped for his/her signature. The signature is not an “approval” to drop, but rather confirmation that the student has discussed the drop/withdrawal with the faculty member. The form must be submitted to the Registrar’s office for processing in person, email Registrar@tamut.edu, mail (7101 University Ave., Texarkana, TX 75503) or fax (903-223-3140). Drop/withdraw forms missing any of the required information will not be accepted by the Registrar’s Office for processing. It is the student’s responsibility to ensure that the form is completed properly before submission. If a student stops participating in class (attending and submitting assignments) but does not complete and submit the drop/withdrawal form, a final grade based on work completed as outlined in the syllabus will be assigned.

Student Technical Assistance:
• Solutions to common problems and FAQ's for your web-enhanced and online courses are found at this link: http://www.tamut.edu/webcourses/index.php?pageid=37
• If you cannot find your resolution there, you can send in a support request detailing your specific problem here: http://www.tamut.edu/webcourses/gethelp2.php
• Blackboard Helpdesk contacts:
  Office hours are: Monday - Friday, 8:00a to 5:00p
  Julia Allen (main contact) 903-223-3154 julia.allen@tamut.edu
  Frank Miller (alternate) 903-223-3156 frank.miller@tamut.edu
  Nikki Thomson (alternate) 903-223-3083
3a) an ability to apply knowledge of math, engineering & science
3b) an ability to design and conduct experiments, as well as to analyze and interpret data
3c) an ability to design system, component or process to meet needs
3d) an ability to function on multi-disciplinary teams
3e) an ability to identify, formulate, and solve engineering problems
3f) an understanding of professional and ethical responsibility
3g) an ability to communicate effectively
3h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
3i) a recognition of need for, and ability to engage in life-long learning
3j) a knowledge of contemporary issues
3k) an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.