ETDE 1373-60611 DIGITAL SYSTEMS and MICROCONTROLLERS

Course Description:
Introduces digital logic, number systems, and circuits as they relate to computing, memory, and control systems. Topics include numbering systems, logic gates, flip-flops, counters, shift registers, latches, decoders, multiplexers, interfaces, displays, I/O, and timing circuits. Students learn how to research and use manufacturer specification sheets. Students learn computer communication systems, communication standards, and troubleshooting. Microprocessors, microcontrollers, and embedded systems are introduced. Students complete a course project using a microcontroller that demonstrates hardware control and software programming. Technical reports and presentations are vital components of the course.

Type of Course: Theory/Lab
Total Credit Hours: 3; Total hours of theory per semester: 35; Total hours of lab per semester: 40
Class length: Full Semester
Class days & times: Monday, Wednesday and Friday, 8:00 a.m. to 9:25 a.m.
Prerequisites: ETDE 1363

Instructor Name: Darrel Cunningham
Instructor Phone: (918) 293-4871
Office: ET bldg. A11, Room 15K
Instructor E-mail: darrel.cunningham@okstate.edu

Contact: My preferred method of contact is e-mail. Please allow 24-48 hours to return your correspondence during the normal work week.

Instructor’s Office Hours: Monday & Wednesday 2:00 p.m. to 3:00 p.m. or by appointment

School of Engineering Technologies
School Phone: (918) 293-5150

REQUIRED BOOKS, MATERIALS & TOOLS


References: http://www.pearsonhighered.com/careersresources/
Fritzing Software: www.fritzing.org

Materials: Notebook, Composition book (graphing), Pencils, Pens, 16+ GB Flash Drive, Scientific/Engineering Calculator

Tools: Electrical/Electronics Tool/Parts Kits from prerequisite courses
Digital Parts Kit - EET1373
Arduino UNO microcontroller, USB cord, and power supply.

Estimated Cost for Textbooks: $298.90
Estimated Cost for Tools: $155.00
ETDE 1373: Digital Electronics & Microcontrollers

Upon completion of the course, students should be able to:

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<th>Course Objectives</th>
<th>Assessment of Objectives</th>
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<tr>
<td>1 Convert between different number systems such as binary, decimal, octal, hexadecimal and BCD</td>
<td>Homework, Exam</td>
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<td>2 Demonstrate a knowledge of digital logic families.</td>
<td>Lab Activities, Exam</td>
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<tr>
<td>3 Interpret the data sheets of different ssi and msi digital integrated circuits.</td>
<td>Homework, Lab Activities</td>
</tr>
<tr>
<td>4 Construct and analyze digital circuits with simple logic gates.</td>
<td>Lab Activities, Exam</td>
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<td>5 Minimize logic circuits using Boolean equations and karnaugh mapping.</td>
<td>Homework, Lab Activities, Exam</td>
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<tr>
<td>6 Implement combinational circuits and interface external devices to analyze their operation and performance.</td>
<td>Homework, Lab Activities</td>
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<tr>
<td>7 Implement timing and sequence circuits using sequential logic.</td>
<td>Homework, Lab Activities</td>
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<tr>
<td>8 Interpret the architecture of an Atmega microcontroller based circuit.</td>
<td>Lab Activities</td>
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<tr>
<td>9 Write, read &amp; modify programs in the Arduino environment successfully to build simple control systems.</td>
<td>Lab Activities, Design Project*</td>
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Aspects of the course objective assessments may be used in the university’s assessment of student learning. If applicable, an asterisk (*) above indicates this course is used in the university assessment program.

*(Please asterisk the assignment above if utilized for the assessment assignment.)*
COURSE ACTIVITIES
In this course students will:

- ESTABLISH DESIRE2LEARN ACCOUNT AND ACCESS THE ONLINE COURSE ANNOUNCEMENTS, INFORMATION, COURSE DOCUMENTS, RESOURCE DOCUMENTS, RESOURCE LINKS, LAB ASSIGNMENTS AND PROJECTS.
- Participate in class discussions and activities.
- View videos that depict the various concepts.
- Participate in class labs and submit lab reports for evaluation.
- Complete outside project assignments and submit technical reports for evaluation.
- Integrate internet-searches into assignments and reports.
- Participate in individual and group presentations.
- Compile a portfolio of skills learned and work produced.
- Take examinations
- Complete reading assignments

EVALUATION - GRADES WILL BE BASED ON THE QUALITY AND COMPLETION OF THESE TASKS:

<table>
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<tr>
<th>Task</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework/Quizzes</td>
<td>15%</td>
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<tr>
<td>Arduino labs</td>
<td>20%</td>
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<tr>
<td>Labs</td>
<td>20%</td>
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<tr>
<td>Team Project*</td>
<td>20%</td>
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<tr>
<td>Unit Exams</td>
<td>25%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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* The student’s grade for the Team Project will be used in the university’s assessment of student learning. A 70% competency or higher receives a Pass rating. This Pass/Fail rating is independent of the student’s course grade.

Daily and/or weekly quizzes, small weekly assignments and similar type projects: Normal return time to student by next class meeting or no later than one (1) week.

Extensive assignments, large lab projects, extensive quizzes, exams and similar type projects: Normal return time to students in one (1) to two (2) weeks.

AUTHORIZED TOOLS
Instructors Policy to Submit Work
To provide students with improved feedback, technical documents shall be submitted electronically via D2L unless approval is received for other methods. To ensure students learn to submit documents electronically, students are required to submit work in Microsoft Word format and follow a pre-define template and format. Students will be asked to meet a goal in data recording and analysis by submitted data plots in Microsoft Word format (after creating in a Microsoft Excel or other professional software format) with the aid of team members and instructor advisement. All individual submissions must be submitted as one Microsoft Word document unless instructed otherwise. Documents that are not legible will be given a grade of zero. NO EXCEPTIONS!
**LATE WORK**

- *No late work will be accepted unless it meets the requirements for an excused absence according to OSUIT policy or at instructor discretion.*
- *Quizzes and Group Activities* are in-class lecture assessments that cannot be made-up under any circumstances. Attendance is mandatory.
- *Research, Homework, Lab and Project* reports submitted before the posted due date and time on D2L or written assignment sheet is considered to be on time. Presentations CANNOT be made up.
- *Unit Exams and Final Exam* CANNOT be made up without strict approval and penalty! If you miss an exam, it cannot be made up unless your absence meets the requirements for an approved absence. Make-up exams may be different from the exam given in class and may be more difficult. If you know in advance that you will miss an exam, special arrangements to re-schedule the exam may be possible for hardship circumstances.

**TESTING**
The following guidelines will be enforced during in class exams:

- All materials not required for the exam must be placed off the desk
- Scientific/Engineering Calculators are allowed unless otherwise noted
- Once testing has started you are not allowed to leave the room until you have completed the test. Doing so will immediately end the test for you.
- All material associated with the exam must be submitted upon completion.
- All tests will have a defined time for completion.
- Exceptions may be made to these rules at the instructor’s discretion

**Student Conduct and Other Lab and Classroom Policies**
Students are expected to cooperate in maintaining a classroom environment conducive to learning. *Courteous and respectful behavior will be expected from all students each day.* This is a BYOD allowed environment. You can bring your smart devices and laptops to class to be used as a learning tool during class time. If I determine that its use is disrupting class I will require you to turn it off. The use of tobacco in any form in University buildings is prohibited.

- Students are expected to maintain a neat, clean, and organized classroom and lab work place. After completion of a lab or at the end of the class period, components must be returned to the appropriate storage location they were obtained from. Instruments, test probes, and any items used to perform an experiment must also be returned to the appropriate storage location. All other instruments must be turned-off.
- Class computers are to be used for teaching/learning only. Do not use for entertainment or casual internet surfing or chatting.
- Students are expected to maintain a respectful manner during class-sleeping or otherwise assuming a laid down position will not be tolerated.
- Safety Glasses are required while in the lab setting. NO EXCEPTIONS!
- NO food or drink is allowed in the classroom by students
- Students are expected to check D2L and e-mail for announcements and assignments on a daily basis.
• All research assignments, written formal Lab Reports, project work, etc. must be submitted in the appropriate folder in the D2L dropbox.

Dress Code
1. Shoes must cover entire foot.
2. Clothing with obscene logos are not to be worn.
3. Hats and sunglasses may not be worn in the classroom setting.
4. Clothing that is saggy/baggy should not be worn for safety reasons.
5. Jewelry should be removed in the lab setting.

E-Mail Communication Standards
Students are encouraged to use e-mail when communicating personal issues with their instructor. E-mail corruption is a significant problem and unidentified e-mails are simply purged. Therefore a strict standard is necessary to identify a legitimate student communication. The “message line” of student e-mails must contain in order – Subject, Name, Course, and Trimester. Example: Missing Assignment, John Smith, ETDE 1263, Fall 2014.

UNIVERSITY & COURSE EXPECTATIONS
It is the responsibility of each OSUIT student to read, abide by and maintain a copy of the syllabus for this course. Syllabi are available on the OSUIT website.

Students understand that excerpts or portions of their work may be utilized for institutional assessment purposes. The purpose of institutional assessment is for verification of student learning and program improvement. Every effort will be made to keep this information confidential.
Institutional Attendance Policy for Face to Face courses:
A primary component of OSUIT's Mission is “to prepare and sustain a diverse student body as competitive members of a world-class workforce.” Regular and consistent attendance not only aids in academic success, dependable attendance is a requirement in today's real-world employment; therefore, regular and consistent attendance is a requirement in all OSUIT courses.

Definitions:
Absent: Failing to attend all or a significant portion of a class or lab session.
   A. Students may not be marked as absent if missing class for situations such as, but not limited to
      1. participating in a required university activity such as a field trip;
      2. fulfilling a military obligation;
      3. a mandatory court appearance;
      4. death in the immediate family;
      5. extreme illness or accident to oneself or immediate family. Instructors, at their discretion, may require proof of such events.
   B. It is the responsibility of the student to contact and inform the instructor and/or department in advance of such excused absences whenever possible.

Tardy: Arriving late to class as defined by the individual class instructor. Faculty, at their discretion, may equate three tardies to equal one absence.

Procedures:
Early Intervention
   A. Any student who misses 10% of an individual course (or earlier at faculty discretion) during a regular fifteen-week semester, or the equivalent portion of time in a shorter session, will have their name submitted by that course instructor to the OSUIT Early Alert System for retention intervention.
   B. At the point the Early Alert is issued, the student must meet with their assigned faculty advisor or designated faculty/staff member within seven (7) academic calendar days for counseling on how to improve their attendance and academic success.

Excessive Absences
   A. The University reserves the right to administratively withdraw any student from an individual course who misses 20% of that course, whether excused or unexcused, and, in the opinion of the instructor, the student does not have a reasonable opportunity to be successful in the course.
   B. Students should be aware any of the following may impact their financial aid:
      1. being administratively withdrawn from a course
      2. dropping a course
      3. their last date of attendance in a course

Please see OSUIT Policy 2-021 for full details and procedures.
ACADEMIC DISHONESTY
Academic dishonesty or misconduct is neither condoned nor tolerated at OSUIT. Any student found guilty of academic dishonesty or misconduct shall be subject to disciplinary action. Academic dishonesty and/or misconduct includes, but is not limited to, the following actions: (1) Plagiarism: the representation of previously written, published, or creative work as one’s own; (2) Unauthorized collaboration on projects; (3) Cheating on examinations; (4) Unauthorized advance access to exams; (5) Fraudulent alteration of academic materials; (6) Knowing cooperation with another person in an academically dishonest undertaking. Students are required to actively protect their work against misuse by others. For details, refer to The OSUIT Student Handbook (Student Rights and Responsibilities Governing Student Behavior) available online at http://www.osuit.edu/academics/forms/student_rights_responsibility.pdf.

Americans with Disabilities ACT (ADA)
According to the Americans with Disabilities Act, each student with a disability is responsible for notifying the University of his/her disability and requesting accommodations. If you think you have a qualified disability and need special accommodations, you should notify the instructor and request verification of eligibility for accommodations from the Office of Academic Accommodations/LASSO Center. Please advise the instructor of your disability as soon as possible, and contact The LASSO Center, to ensure timely implementation of appropriate accommodations. Faculty have an obligation to respond when they receive official notice of a disability but are under no obligation to provide retroactive accommodations. To receive services, you must submit appropriate documentation and complete an intake process during which the existence of a qualified disability is verified and reasonable accommodations are identified. The LASSO Center is located on the 3rd floor of the Noble Center. You may call 918.293.4855 for more information or fax documentation to 918.293.4853.
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<tr>
<th>Course Outline Schedule</th>
<th>Topic</th>
<th>Assignment</th>
<th>Due Date</th>
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<tr>
<td>Day/Week 1</td>
<td>Introductory Concepts</td>
<td>Research Paper</td>
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<td>Day/Week 2</td>
<td>Number Systems, Operations &amp; Codes</td>
<td>Homework, Labs</td>
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<td>Day/Week 3</td>
<td>Logic Gates</td>
<td>Homework, Labs, Exam</td>
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<td>Day/Week 4</td>
<td>Boolean Algebra &amp; Logic Simplification</td>
<td>Homework, Labs, Basic logic design project</td>
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<td>Day/Week 5</td>
<td>Combinational Logic Analysis</td>
<td>Exam</td>
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<td>Day/Week 6</td>
<td>Latches, Flip-Flops &amp; Timers</td>
<td>Labs</td>
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<td>Day/Week 7</td>
<td>Shift Registers</td>
<td>Labs</td>
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<td>Day/Week 8</td>
<td>Counters</td>
<td>Labs, Exam</td>
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<td>Day/Week 9</td>
<td>Introduction to Microcontrollers &amp; the Arduino family</td>
<td>Technical Report, Technical drawings</td>
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<td>Day/Week 10</td>
<td>Programming the Arduino</td>
<td>Programming assignment, Labs, Exam</td>
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<td>Day/Week 11</td>
<td>Arduino based project development</td>
<td>Project proposal</td>
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<td>Day/Week 12</td>
<td>Project work (continued)</td>
<td>Parts acquisition</td>
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<td>Day/Week 13</td>
<td>Project Work (continued)</td>
<td>Project Construction &amp; Programming</td>
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<tr>
<td>Day/Week 14</td>
<td>Project Work (continued)</td>
<td>Project Construction &amp; Programming (cont.)</td>
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<td>Day/Week 15</td>
<td>Project Submission &amp; Presentations</td>
<td>Project Final Report &amp; Presentation/Demonstration</td>
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Oklahoma State University Institute of Technology  
ETDE 1373 Digital Systems and Microcontrollers  
Fall Semester 2016

I have read and understand this syllabus, and agree to abide by the policies, procedures and guidelines specified therein.

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Fall Semester 2016

Student Assessment Release

I agree that Oklahoma State University Institute of Technology may excerpt some of my work to be utilized for institutional assessment purposes. The purpose of institutional assessment is for verification of student learning and program improvement. I recognize that every effort will be made to keep this information confidential and that my name will not be associated with my work.

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