Digital Systems
ENGR 2406.001
Department of Engineering
FALL 2017

1. **COURSE INFORMATION**
   Course number/section: ENGR-2406_001
   Class meeting time: Lec: TR 9:30-10:45AM, Lab: TR 2:00-3:15PM
   Class location: EN220, EN220 (Lab)
   Course Website: https://bb9.tamucc.edu/webapps/login

2. **INSTRUCTOR INFORMATION**
   Instructor: Cosmina Nicula
   Office location: EN316K
   Office hours: MW 11:00AM-12:00PM, TR 11:00-12:00AM, F 11:00-13:00AM
   Telephone: 361-825-3569
   E-mail: Cosmina.Nicula@tamucc.edu
   Appointments: send an e-mail request for appointment, with proposed time.

3. **COURSE DESCRIPTION**
   **Catalog Course Description**
   This course introduces the principles of digital logic analysis and design. Topics include logic functions, logic gates, number systems and conversions, Boolean algebra, logic simplification, combinational circuits, programmable logic devices, sequential circuits, and use of analysis and simulation software. The laboratory provides hands-on experience with devices and circuits discussed in the classroom. Multisim software is used for digital circuit analysis and simulation.

   **Extended Course Description (ENGR2406)**
   Introduction to theory and design of digital logic, circuits, and systems. Number systems, operations and codes; logic gates; Boolean Algebra and logic simplification; Karnaugh maps; combinational logic; functions of combinational Logic; flip-flops and related devices; counters; shift registers; sequential logic; memory and storage.

4. **PREREQUISITES AND COREQUISITES**
   1. Requires Registration in Lec/Lab/Rec;
   2. **Prerequisite course required** - COSC1330
      or **Prerequisite course required** - COSC1435)
      and ( **Prerequisite course required** - ENGR2460
      and **Prerequisite course required** - MATH2414);  
   3. Corequisites: None

5. **REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES**

Optional Textbook(s) or Other References
Website: https://bb9.tamucc.edu/webapps/login. This will be used primarily for student interface with information and assignments. Check it daily!!

6. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Solve problems involving digital codes, operations, and number systems.
2. Define, describe, and analyze fundamentals of Boolean algebra and digital logic gates.
3. Describe, analyze, design, and fabricate combinational logic circuits.
4. Describe, analyze, design, and fabricate sequential logic circuits.
5. Describe and explain the fundamentals of memory operations.
6. Apply computer mathematical and/or simulation tools to solve digital systems problems

7. INSTRUCTIONAL METHODS AND ACTIVITIES

Methods and activities for instruction include the following: lectures, homework assignments, laboratory exercises, and examinations.

8. MAJOR COURSE REQUIREMENTS AND GRADING

Assessment is based on two midterm exams, lab reports, lab quiz/test, homework, pop quizzes, and a final exam. Expect a quiz when homework is due. The final exam is comprehensive. You may examine the final exam within four weeks after the final grades are assigned.

Lab work will be assigned every week as related to the topics in class. Each lab has background information at the beginning, and pre-lab work may be done at home to save lab time. A due date will be assign and late assignments will NOT be accepted.

Homework is due at the beginning of class on the classroom desk on the due date. Any time thereafter is considered late and will need to be accepted by instructor if it has been graded. A deduction of points may be given. Leaving it on my inbox does not guarantee it will be accepted. If submitting it early the assignment needs to be labeled clearly on front of it.
**Course Folder**

This consists of a simple letter size two pocket folder where all graded and returned assignments will be placed. On the left side place Exams (1 & 2) followed by Quizzes (1 to ?), then HW (1 to ?). On the right side place your labs (1 to ?). It must be complete and organized for full credit.

9. **CONTENT/SCHEDULE**

Final student project design of a complete circuit system using what has been learned from the lab work in the course. This could include an “original” student design, or a proven design from outside source material. The emphasis is to choose a schematic that is not excessively simple, and consist of multiple gates or higher order integrated circuit packages. (Report Required)

<p>| Tentative Laboratory Schedule (Subject to change) |</p>
<table>
<thead>
<tr>
<th>EXP. #</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lab Instruments</td>
</tr>
<tr>
<td>2</td>
<td>Constructing a Logic Probe</td>
</tr>
<tr>
<td>3</td>
<td>Number Systems</td>
</tr>
<tr>
<td>4</td>
<td>Logic Gates</td>
</tr>
<tr>
<td>7</td>
<td>Boolean Laws &amp; DeMorgan's Theorem</td>
</tr>
<tr>
<td>8</td>
<td>Logic Circuit Simplification</td>
</tr>
<tr>
<td>9</td>
<td>The Perfect Pencil Machine –Design</td>
</tr>
<tr>
<td>9</td>
<td>The Perfect Pencil Machine - Build and Demo</td>
</tr>
<tr>
<td>11</td>
<td>Adder and Magnitude Comparator</td>
</tr>
<tr>
<td>12</td>
<td>Combinational Logic Using Multiplexers</td>
</tr>
<tr>
<td>13</td>
<td>Combinational Logic Using Demultiplexers</td>
</tr>
<tr>
<td>14</td>
<td>The D Latch and D Flip-Flop</td>
</tr>
<tr>
<td>16</td>
<td>The J-K Flip-Flops</td>
</tr>
<tr>
<td>17</td>
<td>One-Shots and Astable Multivibrators</td>
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<tr>
<td>18</td>
<td>Shift Register Counters</td>
</tr>
<tr>
<td>23</td>
<td>Design of Synchronous Counters</td>
</tr>
<tr>
<td>24</td>
<td>The Traffic Light Controller</td>
</tr>
<tr>
<td>25</td>
<td>Semiconductor Memories</td>
</tr>
</tbody>
</table>
### TENTATIVE WEEKLY SCHEDULE (subject to change)*

<table>
<thead>
<tr>
<th>WK</th>
<th>Week of</th>
<th>Readings</th>
<th>Lecture</th>
<th>Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9/4</td>
<td>Ch. 1 Ch. 2</td>
<td>Digital concepts Number systems and codes</td>
<td><strong>Lab 1</strong> Lab Instruments</td>
</tr>
<tr>
<td>2</td>
<td>9/11</td>
<td>Ch. 2 Ch. 3</td>
<td>Number systems and codes Logic gates</td>
<td><strong>Lab 2</strong> Constructing a Logic Probe</td>
</tr>
<tr>
<td>3</td>
<td>9/18</td>
<td>Ch 4</td>
<td>Boolean algebra</td>
<td><strong>Lab 3</strong> Number Systems</td>
</tr>
<tr>
<td>4</td>
<td>9/25</td>
<td>Ch 4</td>
<td>Logic simplification</td>
<td><strong>Lab 4</strong> Logic Gates</td>
</tr>
<tr>
<td>5</td>
<td>10/2</td>
<td>Ch 5</td>
<td>Combinational logic</td>
<td><strong>Lab 7</strong> Boolean Laws &amp; DeMorgan's Theorem</td>
</tr>
<tr>
<td>6</td>
<td>10/9</td>
<td>Ch 5</td>
<td>NAND and NOR circuits</td>
<td><strong>Lab 8</strong> Logic Circuit Simplification</td>
</tr>
<tr>
<td>7</td>
<td>10/16</td>
<td>Ch 6</td>
<td>Functions of combinational logic</td>
<td><strong>Lab 9</strong> The Perfect Pencil Machine –Design</td>
</tr>
<tr>
<td>8</td>
<td>10/23</td>
<td>Ch 6</td>
<td>Functions of combinational logic</td>
<td><strong>Lab 9</strong> The Perfect Pencil Machine –Design</td>
</tr>
<tr>
<td>9</td>
<td>10/30</td>
<td>Ch 7</td>
<td>Latches, flip-flops, one-shots and timers</td>
<td><strong>Lab 11</strong> Adder and Magnitude Comparator</td>
</tr>
<tr>
<td>10</td>
<td>11/6</td>
<td>Ch 10</td>
<td>Shift registers</td>
<td><strong>Lab 12</strong> Combinational Logic Using Multiplexers</td>
</tr>
<tr>
<td>11</td>
<td>11/13</td>
<td>Ch 11</td>
<td>Counters</td>
<td><strong>Lab 13</strong> Combinational Logic Using Demultiplexers</td>
</tr>
<tr>
<td>12</td>
<td>11/20</td>
<td>Ch 12</td>
<td>Programmable Logic and Software</td>
<td><strong>Lab 14</strong> The D Latch and D Flip-Flop</td>
</tr>
<tr>
<td>13</td>
<td>11/27</td>
<td>Ch 13</td>
<td>Memory and Storage</td>
<td><strong>Lab 16</strong> The J-K Flip-Flops</td>
</tr>
<tr>
<td>14</td>
<td>12/4</td>
<td>Ch 14</td>
<td>Open / Review</td>
<td><strong>Final project design - Completion</strong></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td><strong>Presentation of the final student project design</strong></td>
</tr>
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**Holiday – No classes**
Please consult the Academic Calendar
([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/))

**Last day to drop a class**
Please consult the Academic Calendar
([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/))

**Final Exam: Tuesday December 12 @ 8:00 – 10:30AM**
FINAL

* Changes in this course schedule may be necessary and will be announced to the class by the Instructor.

* Exam 1, & 2 Dates are tentatively given within that week, not necessarily on Monday.
Exact day of Exam is given one week in advance. No exam makeup is given unless for legitimate cause (a scheduled vacation, wedding, or airline flight is not a legitimate cause).

NOTE 1: Labor Day Holiday 9/4 - No classes
NOTE 2: Last day to drop a class – Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.
NOTE 3: Reading Days 11/22 - No classes
NOTE 4: Campus is closed for Thanksgiving, 11/23-11/24
NOTE 5: Last day of class, 12/6, 2017
NOTE 6: The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

10. COURSE POLICIES

Attendance/Tardiness

You must attend all lectures and laboratories. Grading for Attendance will be deducted after the first absence without a legitimate excuse/cause. Starting with the second absence a $\frac{1}{2}$ % deduction from attendance will apply.

You are responsible for any materials covered or handed out or announcements made in your absence, therefore make arrangements with classmates when this happens. Records of your attendance will be maintained. Tardiness without the prior consent of the instructor is not accepted and will be penalized. Being tardy consistently without consent can be basis to be removed from class or not be permitted to enter class. This is a disruption to other classmates, impolite and not of an ethical person.

Late Work and Make-up Exams

Late work, scheduled exam absences or No-show on lab/project will not be accepted unless there exists legitimate excuses (illness, death in the immediate family, etc.) and adequate documentation is furnished. If a make-up were to be needed it could be a degree higher in difficulty.

Extra Credit

Any will be labeled as such on assignments, exams, and quizzes, etc. Other extra credit to be announced in class as needed.

Cell Phone Use

Cell phone use is prohibited once class begins. They are to be silenced and put away where they are not seen. If a call is expected take it out of the class. Anyone that interrupts class due to cell phone will be asked to leave.

Laptop Use

May be permitted if used for current class work; other uses other than this class is not permitted.

Food in Class

No food or drinks permitted. An exception is bottled water with a cap or sealable lid. Most coffee mugs are not sealable.
Missed Exam
You will receive a zero for a missed exam, unless you have accommodations with Instructor or have a legitimate excuse. You are to communicate any issues immediately.

Participation
To be announced in class when extra points are given.

11. COLLEGE AND UNIVERSITY POLICIES

- Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.
  During an assignment you are allowed to have only what is permitted by instructor, anything else (cell, notebook, book, etc) encounter in your possession will be considered cheating and a proceeding to penalized and document such an act will take place which could include removal from University.

- Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- Statement of Civility
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- Deadline for Dropping a Course with a Grade of W (University)
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to
drop this course. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

  If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

  http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical
campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

12. OTHER INFORMATION

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.