TIDEWATER COMMUNITY COLLEGE
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Official TCC Course Syllabus

Discipline Prefix: EGR	Course Number: 270	Course Title: Fundamentals of Computer Engineering	
	Course Section: D01B		
Credit Hours: 4	Lecture Hours: 3	Clinical Hours:	Lab Hours: 2
Contact Hours: 5	Studio Hours:	Semester: Spring 2020	
Meeting Days/Time/Location: Mondays and Wednesdays 4:20 - 5:35 pm, H-164 Wednesdays, 1:00 – 3:00 pm, H-273			

Instructor Information
Name: Paul E. Gordy
Office Location: H-115, Advanced Technology Center
Office Hours: As posted on office door and on course Canvas site
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Course Website (optional): http://faculty.tcc.edu/pgordy/
Instructor email address (college or VCCS): PGordy@tcc.edu

Course Information

Course Description
Covers the design and organization of digital systems, including number systems, Boolean algebra, logic gates, Karnaugh maps, combinational and sequential logic circuits, timing diagrams, and synchronous and asynchronous controllers. Introduces hardware description language (HDL), FPGAs, microprocessors, and assembly language programming. Includes simulation using PSPICE.

Prerequisites and/or Co-requisites
Prerequisite: EGR 125
Co-requisite: EGR 271

General Education Core Competencies Supported by this Course
After completion of this course, students will be able to:
- **Critical Thinking**
  A competent critical thinker evaluates evidence carefully and applies reasoning to decide what to believe and how to act.
- **Quantitative Literacy**
  Quantitative Literacy is the ability to perform accurate calculations, interpret quantitative information, apply and analyze relevant numerical data, and use results to support conclusions. Degree graduates will calculate, interpret, and use numerical and quantitative information in a variety of settings.
- **Written Communication**
  A competent written communicator can use writing to communicate with others, resulting in understanding and being understood.

Required Course Texts and Supplementary Materials

Textbook -This course will follow the textbook somewhat closely. Reading assignments and problem assignments will generally be made from the textbook that will serve to reinforce concepts covered in the lectures. The textbook used in this course is: M. Moris Mano, **Logic and Computer Design Fundamentals, 5th Edition**, Upper Saddle River, NJ, Pearson Prentice-Hall, 2015. ISBN: 978-0-13-376063-7

Measurable Learning Outcomes

- Represent numbers and perform arithmetic operations in various bases and convert between bases.
- Express, simplify, and minimize Boolean functions through various methods, including truth tables, Boolean algebra, and Karnaugh maps
- Implement logical expressions using defined logic functions.
- Analyze and synthesize combinational logic circuits
- Analyze and synthesize sequential logic circuits, including the use of state diagrams, state tables, excitation tables, and state equations.
- Implement logic circuits using Hardware Description Language (HDL) and Field Programmable Gate Arrays (FPGAs).
- Expose students to concepts in computer architecture.
- Simulate logic circuits and explore concepts in computer organization through the use of HDL and assembly language.

Topics Covered in the Course

- Lecture Topics: Refer to the Course Schedule below for a list of course topics.
- Lab Topics:
  A. Lab #1 Introduction to Logic
  B. Lab #2 Characteristics of TTL gates
  C. Lab #3 Combinational Logic Circuits
  D. Lab #4 7-segment displays, decoders and multiplexers
  E. Lab #5 VHDL Combinational Logic Circuit
  F. Lab #6 Sequential Counters
  G. Lab #7 VHDL Sequential Logic Circuit
  H. Lab #8 Assembly Language/ATmega328P

Description of Assignments/Assessments

- <u>Homework Assignments</u> – Individual assignments, mainly from the textbook
- <u>PSPICE Assignments</u> – Individual assignments using PSPICE circuit analysis software (freeware).
- <u>Tests</u> – Three tests based on the textbook, homework assignments and class notes
- <u>Final Exam</u> – Comprehensive exam
- <u>Lab Reports</u> – Some individual and some team labs. Lab grade is the average of the all lab report grades. All labs require demonstration of circuits to the instructor.

Course Schedule

See separate document for class-by-class schedule, including due dates for assignments and labs.

The following course schedule may change due to the progression of the course. The course schedule may change at the discretion of the instructor; however, students will be notified in writing when any changes/additions are made to the schedule.

I.   Digital Computers and Information (Chapter 1)
    A.   Digital systems
    B.   Number systems
    C.   Decimal and alphanumeric codes
II. Combinational Logic Circuits (Chapter 2)
    A.   Boolean algebra
    B.   Logic gates & implementing logic expressions
    C.   Truth tables
    D.   Canonical forms and standard forms
    E.   Implicants, essential and prime
    F.   Reduction by Karnaugh maps (2-5 variable)
    G.   Product of Sums (POS) and Sum of Products (SOP) implementations
    H.   Don't care conditions
    I.   Multiple-level circuit implementation
    J.   Additional logic gates

Test #1 (Chapters 1 - 2)

III. Combinational Logic Design (Chapter 3)
    A.   Design procedure
    B.   Hierarchical design
    C.   Verification
    D.   Technology mapping
    E.   Rudimentary Logic Functions
    F.   Decoders and enabling
    G.   Encoders, priority encoders, multiplexers, demultiplexers, magnitude comparators
    H.   Implementing combinational logic functions using decoders and multiplexers
    I.   Programmable Logic Devices (PLD) – PALs and PLAs
    J.   Binary addition (half-adder, full-adder, fast carry)
    K.   Binary addition and subtraction using signed numbers
    L.   Adder-Subtractor circuit
    M.   Incrementer, decrementer, increment-by-N, decrement-by-N circuits
IV. Hardware Description Language for combinational logic circuits and FPGAs

Test #2 (Chapter 3)

V.   Sequential Circuits (Chapter 4)
    A.   Flip-flops and latches
    B.   Sequential circuit analysis
    C.   Mealy models and Moore models
    D.   State diagrams and state tables
    E.   Sequential circuit timing
    F.   Design of sequential circuits
    H.   Hardware Description Language (HDL) for sequential circuits and FPGAs
VI. Computer Architecture, Microcontrollers and Assembly Language (Chapter 10, handouts, notes)
    A.   Microprocessors & microcontrollers. RISC, CISC, ARM architectures.
    B.   Memory. Von Neuman and Harvard architectures.
    C.   Instruction Set Architecture and assembly language.
    D.   Atmel Studio – assembling and simulating
    E.   Programming concepts

Test #3 (Chapter 5 and Assembly language) – Take-home test

VII. Registers and Counters (Chapter 5)
    A.   Registers and register operations
    B.   Synchronous and ripple counters
    C.   Asynchronous counters versus synchronous counters
VIII. Tri-state devices (Section 6.8)

FINAL EXAM (Comprehensive)

Grade Policy

Based on the progression of the course, the grade distribution for each assignment may change. However, if changes are made, I will notify students in a timely manner via Canvas. Final grades are made available to each student within the Student Information System (SIS) now web delivered via MyTCC or SIS.

Course grades will be computed based on the following percentages:

3 Tests (14% each)	42%
Final Exam (comprehensive)	16%
Homework Assignments (2 dropped)	10%
PSPICE Assignments (2)	8%
Lab Reports (8 labs)	24%

Grades will be based on the following scale:

A: 90 – 100
B: 80 – 89
C: 70 – 79
D: 60 - 69
F: 0 – 59

Course Policies & Procedures

Course Communication

Students should check Canvas and their VCCS student email accounts regularly (at least every 72 hours). The best way to reach the instructor is by email. The instructor will respond within 72 hours, although generally much sooner.

Attendance Policy

All students are expected to be present and on time at all scheduled class and laboratory meetings. Instructors are not required to admit a student who arrives late to the classroom. A student who adds a class or registers after the first day of classes is counted absent from all class meetings missed.

If a student is absent more than 15 percent of scheduled instructional time, attendance may be defined as unsatisfactory. This calculation includes absences occurring during the add/drop period. See also the Withdrawal Policy in this syllabus for more information. Per the college's attendance policy, faculty have the right to develop a more stringent policy as well. Students who do not attend or participate in class by the deadline to drop for tuition refund may be deleted from the course.

Late Work/Make-up Exam Policy

- Homework is not accepted late, but the 2 lowest homework grades will be dropped. Homework may be submitted during class, slid under the instructor's office door, or submitted in Canvas. Homework will not be accepted by email.
- Lab reports are due one week after the lab was performed. Late lab reports will be accepted with a 10-point penalty.
- Late PSPICE assignments will be accepted with a 10-point penalty.
- Students are advised not to miss a lab period. However, if a lab period is missed the student may work with the instructor to find a day and time to make up the lab.
- All labs require demonstration of proper circuit operation. No lab reports will be accepted unless proper circuit operation has been demonstrated. 10-point penalty for late labs.
- No late assignments or labs will be accepted after the final exam.

Classroom Behavior

TCC is committed to maintaining a social and physical environment conducive to carrying out its education mission. Therefore, all members of the TCC community are expected to demonstrate standards for civility. Be moderate in speaking. Loud, obscene, argumentative, or threatening speech is disruptive to teaching and learning and is offensive to others. It has no place in an academic setting.
Resolve any disagreements in a positive, non-combative manner. Request the assistance of college authorities if needed.
Show respect for the comfort of others in an educational setting by observing acceptable standards for personal cleanliness and dress.

Electronic Devices
Cell phones, pagers, and other communication devices are prohibited from use in classrooms, laboratories, and libraries, unless authorized by the appropriate faculty or staff. Although soundless communication devices such as cell phones and pagers are permissible in classrooms, college offices, and/or meeting rooms, they must not be answered during class.

Inclement Weather/Emergent Hazardous Conditions
Tidewater Community College uses TCC Alerts to immediately contact and inform faculty, staff and students of a major crisis or emergency. TCC Alerts delivers important emergency alerts, notifications, and updates via email, text message or pager.

When an incident or emergency occurs, authorized senders will be instantly notified via TCC Alerts. TCC Alerts is a personal connection to real-time updates, instructions on where to go, what to do, or what not to do, who to contact, and other important information. New users may register via the link on the College's Closings & Emergencies webpage (https://www.tcc.edu/closings-emergencies).
All students are encouraged to sign up for TCC Alerts as soon as possible. If you have already subscribed, please verify your contact information is up-to-date in TCC Alerts.

Disposition of Classes for Emergency Shutdown of the College
In the event of an emergency shutdown of the college, the president and the executive staff may elect to conclude the term in session if eighty-five percent or more of that term has been completed. If the term in session is concluded, faculty shall compute final grades of students based on coursework completed at that point.

Academic Policies & Procedures
Students are responsible for being aware of the policies, procedures, and student responsibilities contained within the current edition of the TCC Catalog and Student Handbook.

Withdrawal Policy
Students who wish to withdraw without academic penalty should contact a counselor to determine the appropriate procedure. Withdrawals through completion of 60 percent of a session will result in a W grade. After 60 percent of a session is completed, a withdrawal will result in a grade of F in a credit course or a grade of U in a developmental course, except under mitigating circumstances that must be documented by the instructor and approved by the academic dean. Dynamic session classes have unique refund and withdrawal dates. Contact a campus Enrollment Services Office for more information, or visit the Academic Calendar website (URL provided in Important Websites section).

A student who drops after the last day to withdraw does not receive a 'W'. He/she receives an 'F', in which case there is both an academic and financial penalty. A student who withdraws by the deadline faces a financial penalty, but not an academic penalty.

01/29/2020	Deadline to drop for tuition refund
03/27/2020	Deadline to withdraw without academic penalty and to receive a grade of W for the course

Academic Integrity
TCC will expect students to demonstrate personal and academic integrity, to be open to new ideas, and to share in a community where individuals from diverse backgrounds and cultures help one another grow intellectually, socially, and personally.
TCC expects students to achieve, not just to get by. And while many caring and talented faculty and staff are here to help, students must take responsibility for their own learning. Students should strive for a high level of academic performance and to be responsible, contributing citizens within the college and in outside

communities. Above all, TCC wants students to develop a love of learning that will last a lifetime, along with a life-long interest in maintaining emotional and physical wellness.

Student Outcomes Assessment Requirement
Work products submitted by students to fulfill course requirements may be used by the college to evaluate its academic programs and general education requirements.

Plagiarism and Academic Misconduct
Academic misconduct includes, but is not limited to, the following actions: cheating on an examination or quiz—either giving or receiving information; copying information from another person for graded assignments; using unauthorized materials during tests; collaboration during examinations; buying, selling or stealing examinations; arranging a substitute for oneself during examinations; substituting for another person, or arranging such a substitution; plagiarism—the intentional or accidental presentation of another's words or ideas; collusion with another person or persons in submitting work for credit in class or lab, unless such collaboration is approved in advance by the instructor.

Faculty members who have reliable evidence of academic misconduct will (1) investigate the matter, and (2) review the facts of the matter and the proposed penalty with the appropriate academic dean. They may then take one or more of the following actions:
Require the work to be accomplished again
Give no credit for the test, paper, or exercise
Assign a grade of F, U, or W for the course
Refer the matter to the campus Dean for Student Services or designee for possible disciplinary sanction through the college's disciplinary procedure

If the faculty member chooses to refer the matter to the campus Dean for Student Services or designee for disposition, the Plenary Disciplinary Procedure shall be followed, and the student's dismissal from the college is a possibility.

Educational Accessibility
Students who have documented, diagnosed disabilities, and who need special accommodations for tests, etc., are advised to see the Educational Accessibility Disabilities Services staff in Student Services so that the instructor may be notified of what accommodations are appropriate in each case. Requests for accommodations should be made to the designated campus Educational Accessibility counselor at least 45 days before classes begin. Documentation must be provided to support the need for accommodations.
Students who have been hospitalized (for medical or psychiatric reasons) unexpectedly during the semester shall contact the Office of Educational Accessibility Counselor for support and connection to college resources. If the student is incapacitated, a designee may make contact on their behalf.
For assistance with disabilities, contact the campus Educational Accessibility Counselor/Provider or the Coordinator of Educational Accessibility Services: call 822-7752, visit Student Services/Development, or visit the Educational Accessibility webpage (URL provided in Important Websites section).

Emergency Procedures
In the event of a bomb threat, tornado, or fire, students and staff may be directed to evacuate the building or move to an internal assembly area within the building. Evacuation routes are posted in each classroom. The map indicates the route to the nearest exit. Students should review the map to make sure that the exit routes for the building are clearly understood. The information regarding locations of the Emergency Assembly Areas and Internal Assembly Areas for all classrooms or spaces used on the various campuses is available on the Crisis and Emergency Management Plan (CEMP) webpage (https://web.tcc.edu/emergency/cemp.htm). If you require assistance during an evacuation, let your instructor know at the end of the first class.

Student Success Resources
The following resources are available to TCC students. Visit the *Student Handbook* webpage for more information about student services and locations.

Library
 A library is located at each TCC campus and at the Visual Arts Center. These libraries are intended for research and study, and they contain materials in print and digital format to support the courses, curricula, and mission of the college. The research materials include books, newspapers, magazines, journals, DVDs, streaming media and an extensive collection of indexes, abstracts and full-text databases. Faculty members may place materials on reserve in the libraries for their students. Visit the Library webpage for more information: http://libguides.tcc.edu/LibraryPage

Academic Support Services
Each campus provides various kinds of academic assistance. One-on-one tutoring, math and computer labs, and other forms of individual and group assistance may be available. Students can also find free help for writing, from short questions about commas and comma splices to a comprehensive review of research papers in progress, in the Writing Centers.

Online Learning Help Desk
Visit the following website for Canvas support: https://www.tcc.edu/student-services/canvas-support
Canvas offers 24/7 support for students via phone (877-875-8359) and live chat. Live chat support can be accessed from the Help menu once you log into Canvas.
TCC provides Canvas support Monday to Friday, 8:30 a.m. to 5 p.m., by phone (757-822-1470), email (canvas@tcc.edu), and online request form.

Important Websites
• College Website: https://www.tcc.edu
• Closings and Emergencies: https://www.tcc.edu/closings-emergencies
• Student E-mail: https://tcc.my.vccs.edu
• Educational Accessibility: https://www.tcc.edu/student-services/personal-support/students-disabilities
• Student Handbook: https://www.tcc.edu/studenthandbook
• TCC Catalog: https://www.tcc.edu/academics/catalog/
• Class Schedule: https://m.sis.vccs.edu/index.php/app/catalog/classSearch?institution=TC295(or log-in to SIS for current course offerings)
• Academic Calendar: https://www.tcc.edu/academics/calendars/
• For current financial aid information and assistance, visit https://www.tcc.edu/paying-for-college/federal-financial-aid/ or https://studentaid.ed.gov/
• Library: https://libguides.tcc.edu/LibraryPage.