Theory of Computation
Department of Computing Sciences
Summer 2017

A. COURSE INFORMATION
Course number/section: COSC5356.001
Class meeting time: Mondays and Wednesdays from 3:00 to 5:30 PM
Class location: Center for the Sciences Room CS103
Course Website: TBD

B. INSTRUCTOR INFORMATION
Instructor: David R. Thomas
Office location: Center for Instruction Room 319
Office hours: M-TH from 11:30 AM-12 noon;
M-W from 2:00 PM – 3:00PM, or by appointment
Telephone: 361-825-2475
E-mail: david.thomas@tamucc.edu
Appointments: at lecture, by email or serendipity (please knock)

C. COURSE DESCRIPTION
Catalog Course Description
An introduction to theoretical foundations of modern computing. Topics include finite state machine concepts, formal grammars, and basic computability concepts.

Extended Course Description
This course concerns some fundamental properties and/or limitations shared by all digital computer systems. In our study we will not be concerned with questions concerning any particular hardware or software. Instead, we will answer questions such as those that follow.

1. What are some relevant computational models for digital computation?
2. What are the capabilities and limitations of some of these models?
3. What is the time complexity of a particular solution to some problem?

In our course we will be mostly concerned with solutions to question numbers 1 and 2.

D. PREREQUISITES AND COREQUISITES
Prerequisites: MATH2305, Discrete Mathematics I;
COSC5321, Data Structures
Corequisites: none
E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES


Optional Textbook(s) or Other References: none

Supplies: none

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

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

1. Demonstrate knowledge of a framework for the theoretical analyses of relevant models of digital computation.

2. Perform detailed analyses concerning the capabilities of selected computational models.

3. Demonstrate knowledge of some general time-complexity characteristics of selected problems when solved using our models of computation.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

Lecture and discussion, examination topic reviews, written examinations

H. MAJOR COURSE REQUIREMENTS and GRADING

Course grades will be determined by three examinations concerning textbook material, lectures, and selected text problems. Each examination will contribute equally towards the final grade, which will be determined using a “traditional” 90%, 80%, 70%, … scheme. These examinations will occur (approximately) on the 5-th, 10-th and final class meeting days.

I. COURSE CONTENT/SCHEDULE

We will proceed guided by the outline that follows. The integer at the left of a line indicates the appropriate textbook section.

Part 0: Introduction (Chapter 0, 2 meetings)

0. General Information
   0.1 Automata, Computability, and Complexity
   0.2 Mathematical Essentials
   0.3 Definitions, Theorems, and Proofs
0.4 Methods for proof

Part 1: Automata and Languages
1. Regular Languages, (Chapter 1, 6 meetings)
   1.1 Finite Automata
   1.2 Nondeterminism
   1.3 Regular Expressions
   1.4 Non-regular Languages

2. Context-Free Languages (Chapter 2, 3 meetings)
   2.1 Context-free Grammars
   2.2 Pushdown Automata
   2.3 Non-context-free Languages

Part 2: Computability Theory
3. The Church-Turing Thesis (Chapter 3, 3 meetings)
   3.1 Turing Machines
   3.2 Variants of Turing Machines
   3.3 A Definition of Algorithm

4. Decidability (Chapter 4, 2 meeting)
   4.1 Decidable Languages
   4.2 The Halting Problem

Part 3: Complexity Theory
5. Time Complexity (Chapter 7, 3 meetings)
   7.1 Measuring Complexity
   7.2 The Class P
   7.3 The Class NP
   7.4 NP-completeness

Note:

Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. 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.

- **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)**  
The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that must submitted. No student is eligible to receive a W without completing the official drop process by this deadline. 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.

- **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.

**K. GENERAL DISCLAIMER**

The course instructor reserves the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. Changes will be announced in a timely manner during regularly scheduled lecture periods.