Discrete Mathematics II, MATH4328.001
Department of Mathematics and Statistics
Spring 2016

A. COURSE INFORMATION
Course number/section: MATH4328.001
Class meeting time: Tuesday and Thursday from 12:30 to 1:45 PM
Class location: Island Hall 157
Course Website: TBD

B. INSTRUCTOR INFORMATION
Instructor: David R. Thomas
Office location: Center for Instruction Room 319
Office hours: Tuesday and Thursday 12:00-12:30 PM, 4:30-5:30 PM
Wednesday 1:30-3:30, or by appointment
Telephone: 361-825-2475
E-mail: david.thomas@tamucc.edu
Appointments: at lecture, through email, by serendipity (please knock)

C. COURSE DESCRIPTION
Catalog Course Description
A continued study of topics from Discrete Mathematics I with additional topics from discrete mathematics that have strong application to the field of computer science. Additional topics include: recurrence relations, formal languages, and finite-state machines.

D. PREREQUISITES AND COREQUISITES
Prerequisites: MATH 2305, COSC 2437
Corequisites: none

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES
Required Textbook(s)

Optional Textbook(s) or Other References: none

Supplies: none
F. **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.

Course grades will be determined by three examinations whose contents will be guided by the learning outcomes which follow. The examinations will consist of problems and examples selected from the course textbook definitions, theorem statements, and related material. A detailed list of examination topics and a set of sample examination questions will be distributed in class no later than one week prior to each examination.

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

1. Apply regular and strong mathematical induction, demonstrate knowledge of the well-ordering of the integers and its equivalence with mathematical induction.

2. Use the characteristic polynomial to synthesize closed-form solutions for selected recursively-defined sequences.

3. Comprehend selected properties of graphs, their spanning trees, and their representations as matrices.

4. Demonstrate the ability to explain finite-state automata, regular expressions, regular languages and their equivalence.

5. Exhibit knowledge of other topics to include (as time permits) the halting problem, the use of cardinality in demonstrating non-computability, and public-key cryptography.

G. **INSTRUCTIONAL METHODS AND ACTIVITIES**

Lecture and discussion, examination topic review discussions, written examinations

H. **MAJOR COURSE REQUIREMENTS AND GRADING**

Each of the previously-mentioned examinations will contribute equally towards the final grade. The examination average score will be used to assign grades using a traditional 90, 80, 70, 60 percent distribution for “A”, “B”, “C”, and “D”, respectively. The examinations will occur approximately during the fifth week, the tenth week, and during the University-determined final examination period (Thursday, May 5 from 11:00 AM to 1:30 PM.)

I. **COURSE CONTENT/SCHEDULE**
We will proceed guided by the following outline. Familiarity with topics listed under the heading “Prerequisite Material” will, by in large, be assumed. Topics in parenthesis may be covered in summary only.

0. General Introduction (1 meeting)

1. Logic of Compound Statements (Chapter 2; reading only, 0 meetings)
   Prerequisite Material:
   2.1 Logical Form and Logical Equivalence
   2.2 Conditional Statements
   2.3 Valid and Invalid Arguments
   Course Material: None

2. Logic of Quantified Statements (Chapter 3; reading only, 0 meetings)
   Prerequisite Material:
   3.1 Introduction to Predicates and Quantified Statements I
   3.2 Introduction to Predicates and Quantified Statements II
   3.3 Statements with Multiple Quantifiers
   3.4 Augments with Quantified Statements
   Course Material: None

3. Elementary Number Theory and Methods of Proof (Chapter 4; 1 meeting)
   Prerequisite Material:
   4.1 Direct Proof and Counterexample I: Introduction
   4.2 Direct Proof and Counterexample II: Rational Numbers
   4.3 Direct Proof and Counterexample III: Divisibility
   4.6 Indirect Proof Contradiction and Counterexample
   Course Material: 4.7 Irrationality of $\sqrt{2}$ and the Infinitude of Primes

4. Sequences and Mathematical Induction (Chapter 5; 4 meetings)
   Prerequisite Material:
   5.1 Sequences
   5.2 Mathematical Induction
   Course Material:
   5.3 Mathematical Induction II
   5.4 Strong Mathematical Induction and the Well-Ordering Principle
   5.6 Defining Sequences Recursively
   5.7 Solving Recurrence Relations by Iteration
   5.8 Second Order Linear Recurrence Relations with Constant Coefficients
   5.9 General recursive Definitions

5. Graphs and Trees (Chapter 10; 5 meetings)
   Prerequisite Material:
   10.1 Graphs
   10.5 Trees
   Course Material:
   10.2 Paths and Circuits
   10.3 Matrix Representation of Graphs
   10.4 Isomorphisms of Graphs
   10.6 Spanning Trees

6. Regular Expressions and Finite-State Automata (Chapter 12; 3 meetings)
Prerequisite Material:
None
Course Material:
12.1 Formal Languages and Regular Expressions
12.2 Finite-State Automata

7. Relations (Chapter 8; 6 meetings)
Prerequisite Material:
None
Course Material:
(8.1 Relations on Sets)
(8.2 Reflexivity, Symmetry, Transitivity)
(8.3 Equivalence Relations)
8.4 Modular Arithmetic and Application to Cryptography

8. Other Topics (Chapters 6 and 7, 2 meetings)
Prerequisite Material:
None
Course Material:
6.4.3 The Halting Problem
7.4 Cardinality and Applications to Computability

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. COURSE POLICIES

Everyone is expected to conduct themselves in a manner appropriate for University Students. Hence, should you arrive late please enter quietly.

K. 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.

L. 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.

M. 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.