Discrete Mathematics II
Department of Mathematics and Statistics
Spring 2015

A. COURSE INFORMATION
   Course number/section: MATH4328/001
   Class meeting time: Tuesday and Thursday from 12:30 to 6:45 PM
   Class location: Island Hall 268
   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, 4:00--4:30PM
   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)
   Discrete Mathematics with Applications by Susanna Epp, fourth edition, Thomson
   Publishing Company

   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. 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 find closed-form solutions for selected recursively-defined sequences.
3. Demonstrate knowledge of selected properties of graphs, their spanning trees, and their representations as matrices.
4. Exhibit understanding of 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**

Course grades will be determined by three examinations whose contents will be guided by the previously described learning outcomes. 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 will be distributed in class prior to each examination.

Each examination 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.

I. **COURSE CONTENT/SCHEDULE**

We will proceed guided by the following approximate 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 Two Classical Theorems: 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:
   7.4 Cardinality and Applications to Computability
   6.4.3 The Halting Problem

J. COURSE POLICIES
   Everyone is expected to conduct themselves in a manner appropriate for University Students. If you arrive late please enter quietly.

K. COLLEGE AND UNIVERSITY POLICIES
   - Academic Integrity (University)
     It is expected that university students will demonstrate a high level of maturity, self-direction, and ability to manage their own affairs. Students are viewed as individuals who possess the qualities of worth, dignity, and the capacity for self-direction in personal behavior.
     See Full University Policy at http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity

   - 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.
• **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 by Friday, April 10, 2015. No student is eligible to receive a W without completing the official drop process by this deadline. Visit the Office of the University Registrar for the Course Drop Form that must submitted. After April 10, 2015 a student will not be allowed 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](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](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**
  Disability Services (DS) is the hub for coordinating services and accommodations to ensure accessibility and utilization of all programs for all Texas A&M University-Corpus Christi students with disabilities. Our services are designed to meet the unique educational needs of enrolled students with documented permanent or temporary disabilities. DS provides intake and consultation services to students seeking to register with our office. DS reviews an individual’s documentation of disability and assesses eligibility for services and the determination of reasonable accommodations. For more information visit the Disability Services Office at 116 Corpus Christi Hall or go to [http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/)

**L. OTHER INFORMATION**
None

**M. 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.