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MATH 253: DISCRETE MATHEMATICAL STRUCTURES (FALL 2014)

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Course number: MAT 253

Course title: Discrete Mathematical Structures

Credits: 3

Meetings: MWF 9:00–9:50 AM, Petty 227

Prerequisites: Grade of at least C in MAT 151 or an acceptable score on the mathematics placement test.

Instructor information:
Instructor: Dr. Dan Yasaki   d_yasaki@uncg.edu
Homepage: http://www.uncg.edu/math/faculty/d_yasaki/teaching.html
Office Hours (146 Petty): MWF 10:00–11:00 AM

For whom planned: This is a core course designed for mathematics majors as an early introduction to discrete mathematical structures, rigorous proof techniques, and mathematical programming.

Catalog description: A rigorous introduction to discrete mathematical structures, proof techniques, and programming. Topics include sets, functions, sequences, relations, induction, propositional and predicate logic, modular arithmetic, and mathematical programming.

Student learning outcomes: Upon successful completion of this course, students will be able to:
- define the fundamental discrete mathematical structures.
- identify and describe various types of relations.
- explain how RSA encryption allows for secure message transcription.
- translate pseudocode algorithms into Python scripts.
- compute the number of solutions to several arrangement problems.
- analyze simple algorithms and identify values of variables at various stages of completion.
- combine definitions and results produced in class to create rigorous proofs of basic statements about discrete mathematical structures.
- evaluate an argument for logical validity.

Teaching methods and assignments for achieving learning outcomes: The course material will be presented via traditional lectures. Achievement of learning outcomes will be facilitated via homework assignments, programming projects, and exams.

Evaluation and grading: Semester averages are rounded to the nearest point, and letter grades are assigned on a 10 point scale.

A+ : 97–100	B+ : 87–89	C+ : 77–79	D+ : 67–69
A : 93–96	B : 83–86	C : 73–76	D : 63–66 F : 0 − 59
A− : 90–92	B− : 80–82	C− : 70–72	D− : 60–62

- Programming projects (15%): All projects are weighted equally. Dues dates are posted on the website.
- Weekly homework assignments (10%): All asignments are weighted equally. Due dates are posted on the website.

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- Tests (75%): Three tests count 15% each. The final exam counts 30%. The dates are
  (1) Test 1 (Wednesday, September 17)
  (2) Test 2 (Monday, October 20)
  (3) Test 3 (Monday, November 24)
  (4) Final exam (Monday, December 8, 8–11 AM)

Required materials:

- Textbook: *Discrete Mathematics and Its Applications* by Kenneth H. Rosen (seventh edition)
- Software: *Python 3.X* You can use Python on the central Linux server of UNCG. It is also installed on the computers in all ITS computer labs. You can download it for free at

  `http://www.python.org/download/`

- We will cover most of the sections 1–5 of the *Python Tutorial* available at

  `http://docs.python.org/py3k/tutorial/`

Academic Integrity Policy: Each student is required to sign the Academic Integrity Policy on all major work submitted for the course.

I have abided by the UNCG Academic Integrity Policy on this assignment.
Signature _____   Date _____

More information can be found at

`http://sa.uncg.edu/handbook/academic-integrity-policy/`.

Final examination: The Final Exam covers the entire semester. The exam is 3 hours and will be given on Monday, December 8, 2014 at 8:00 AM.

Additional information:

(1) Students with Disabilities: If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible. You are responsible for contacting the OARS in 215 EUC (334-5440, `http://ods.dept.uncg.edu/`) and for arranging the necessary forms for me to fill out and sign. Without these forms the services provided by the OARS will not be available. OARS cannot schedule or reschedule tests without consent from the instructor.
(2) Assignments Policy:
   (a) Assignments are due at the beginning of class. Late assignments will be accepted as late as 5 PM on the due date for half credit and not accepted after that.
   (b) Written assignments must be
        (i) legible.
        (ii) stapled (if more than one page).
        (iii) not torn from a spiral bound notebook.
(3) Absence Policy: You are responsible for all missed material. Any missed assignment, test, or final exam will result in a score of 0. Make-up tests and final exam will be given only if you receive prior approval for a valid excuse by contacting me at least one week in advance.

(4) Copyright Policy: Selling or purchasing notes from classes for commercial gain is a violation of the UNCG Copyright Policy.

<div align="center">http://policy.uncg.edu/copyright/</div>

Any student who sells notes taken in class for commercial gain, or who purchases notes taken by another student for commercial gain, is in violation of this policy and, by extension, is committing a violation of the Student Code of Conduct.

<div align="center">http://sa.uncg.edu/handbook/student-code-of-conduct/</div>

(5) Email Policy: All email correspondence should be made using your UNCG email account. You must check your email regularly for updates and announcements.

Tentative Calendar					
	Week of		Topics		Notes
1	8/18	1.1	1.3	P0	Last day to change the course: Friday
2	8/25	1.4	1.7	P1	
3	9/1	–	2.1	P2	Labor Day: Monday
4	9/8	2.2	2.3	P3	
5	9/15	Review	Test 1	P4	**Test 1** (1.1–2.3, P0–P2): Wednesday
6	9/22	2.4	4.1	P5	
7	9/29	4.2	4.3	P6	
8	10/6	4.4	RSA	P7	Last day to withdraw: Friday
9	10/13	–	4.6	Review	Fall Break: Monday
10	10/20	Test 2	5.1	5.1	**Test 2** (2.8–4.6, P3–P7): Monday
11	10/27	5.2	5.3	P8	
12	11/3	6.1	6.2	P9	
13	11/10	6.3	9.1	P10	
14	11/17	9.5	9.5	Review	
15	11/24	Test 3	–	–	**Test 3** (5.1–6.5): Monday Thanksgiving break
16	12/1	Review	–	—	Last day: Monday
17	12/8	Final	–	—	**Final Exam** (1.1–9.5, P0–P10): Monday, 8–11AM

Assignments

P0: Hello World
P1: For and If
P2: Sets
P3: Functions
P4: More Functions and Lists
P5: Fast Exponentiation
P6: Extended Euclidean Algorithm and Primality Testing
P7: RSA Encryption
P8: Recurrence Relations
P9: Dictionaries and Lotteries
P10: Dictionaries and Analysis of Language

Read relevant sections of *Common Mistakes in Discrete Mathematics* (on Blackboard in Course Documents) before submitting homework.

Section	Exercises
1.	**The Foundations: Logic and Proofs**
1.1	Propositional Logic (1, 2, 4, 7, 8, 14, 22, 28, 32)
1.3	Propositional Equivalences (2, 6, 8, 13, 14, 15, 18, 24, 27)
1.4	Predicates and Quantifiers (1, 2, 6, 10, 15, 16, 28, 30, 34, 35, 38, 61)
1.7	Introduction to Proofs (1, 2, 9, 10, 11, 18, 38)
2.	**Basic Structures: Sets, Functions, Sequences, Sums, and Matrices**
2.1	Sets (2, 4 (a,b), 10, 14, 32, 34, 42)
2.2	Set Operations (1, 2, 4, 13, 20, 22, 34)
2.3	Functions (2, 6, 14, 21, 30, 33, 36, 40, 41)
2.4	Sequences and Summations (2, 4, 6 (a–e), 12, 18, 30, 32)
4.	**Number Theory and Cryptography**
4.1	Divisibility and Modular Arithmetic (5, 8, 14, 20, 24, 29, 38, 41, 46)
4.2	Integer Representations and Algorithms (2, 4, 26, 31, 32)
4.3	Primes and Greatest Common Divisors (2, 14, 18, 21, 32, 42)
4.4	Solving Congruences (2, 4, 5, 10, 11, 16, 38, 40, 50, 54)
4.6	Cryptography (2, 4, 5, 8, 24, 25, 26, 27)
5.	**Induction and Recursion**
5.1	Mathematical Induction (3, 4, 6, 10, 15, 18, 20, 31)
5.2	Strong Induction (3, 10, 12)
5.3	Recursive Definitions (2, 5 (a,b), 8, 9, 10, 12, 25)
6.	**Counting**
6.1	The Basics of Counting (1, 2, 4, 12, 18, 22, 30, 33, 34, 46, 52)
6.2	The Pigeonhole Principle (1, 2, 4, 9, 16, 31, 33)
6.3	Permutations and Combinations (1, 2, 3, 5, 6, 8, 18, 19, 23, 24, 25, 26, 28, 34)
9.	**Relations**
9.1	Relations and Their Properties (1, 2, 4, 6, 12, 19, 28, 30, 34)
9.5	Equivalence Relations (1, 2, 9, 15, 25, 36)