Math 253: Discrete Mathematical Structures (Spring 2016)

Course number: MAT 253

Course title: Discrete Mathematical Structures

Credits: 3

Meetings: TR 9:30–10:45 am, Petty 224

Prerequisites: Grade of at least C in MAT 151 or MAT 191.

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	

- Participation (5%): This includes attendance, answering questions, and staying involved in the class.
- Programming lessons (10%): All lessons are graded for completion and administered through Codecademy.

  https://www.codecademy.com/
- Weekly homework assignments (15%): All assignments are weighted equally.

- Tests (75%): The three tests count 15% each. The final exam counts 25%. The dates are shown in the calendar below.

Required materials:

- Textbook: *Discrete Mathematics and Its Applications* by Kenneth H. Rosen (seventh edition)
- Software: *Python 2.7* 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.

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

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/.

Attendance Policy: Attendance is mandatory and measured with a daily sign-in sheet.

Final examination: The Final Exam covers the entire semester. The exam is 3 hours and will be given on Tuesday, May 3 at noon.

Additional information:

(1) UNCG seeks to comply fully with the Americans with Disabilities Act (ADA). Students requesting accommodations based on a disability must be registered with the Office of Accessibility Resources and Services (OARS) in 215 Elliott University Center, 334-5440, http://oars.uncg.edu.

(2) Assignments Policy: Assignments are due in class on the due date and will not be accepted after 11:59 pm on that day.

(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.

http://policy.uncg.edu/copyright/

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.

http://sa.uncg.edu/handbook/student-code-of-conduct/

(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 schedule Spring 2016:

Tuesday	Thursday
Jan 12 Prop. Logic and Applications (1.1, 1.2)	Jan 14 Propositional Equivalences (1.3)
Jan 19† Predicates and Quantifiers (1.4)	Jan 21† Introduction to Proofs (1.7)
Jan 26 Sets (2.1)	Jan 28 Set Operations (2.2)
Feb 2 Functions (2.3)	Feb 4 Sequences and Summations (2.4)
Feb 9 Review	Feb 11 Test 1
Feb 16 Divisibility and Modular Arithmetic (4.1)	Feb 18 Integer Rep. and Algorithms (4.2)
Feb 23 Primes and Greatest Common Divisor (4.3)	Feb 25 Solving Congruences(4.4)
Mar 1 Cryptography (4.6)	Mar 3 RSA
Mar 8 Spring break: No class.	Mar 10 Spring break: No class.
Mar 15 Review	Mar 17 Test 2
Mar 22 Mathematical Induction (5.1)	Mar 24 Strong Induction (5.2)
Mar 29 The Basics of Counting (6.1)	Mar 31 The Pigeonhole Principle (6.2)
Apr 5 Permutations and Combinations (6.3)	Apr 7 Relations and Their Properties (9.1)
Apr 12 Equivalence Relations (9.5)	Apr 14 Equivalence Relations (9.5)
Apr 19† Review	Apr 21† Test 3
Apr 26† No class. Follow Fri schedule.	Apr 28† —
May 3 Final Exam: noon (cumulative)	May 5

†DY in Oberwolfach. GB will cover.

Textbook Assignments

Section	Exercises
1.	**The Foundations: Logic and Proofs**
1.1	Propositional Logic (1, 2, 4, 7, 8, 12–14, 21, 22, 27, 28, 31, 32)
1.2	Applications of Propositional Logic (1–4, 7, 8)
1.3	Propositional Equivalences (1–4, 6–8, 13–15, 18, 24, 27)
1.4	Predicates and Quantifiers (1–6, 10, 15, 16, 28, 30, 34, 35, 38, 61(a–d))
1.7	Introduction to Proofs (1, 2, 3, 5, 9–11, 18, 25, 38)
2.	**Basic Structures: Sets, Functions, Sequences, Sums, and Matrices**
2.1	Sets (1–4, 7, 10, 14, 19, 26, 32, 34, 42)
2.2	Set Operations (1–4, 11–13, 20, 22, 25, 26, 34)
2.3	Functions (1–3, 6, 12–14, 21, 30, 33, 36, 37, 40–42)
2.4	Sequences and Summations (1–4, 6 (a–e), 12, 18, 30–32)
4.	**Number Theory and Cryptography**
4.1	Divisibility and Modular Arithmetic (1, 2, 5, 8, 9, 14, 20, 24, 29, 38, 41, 46)
4.2	Integer Representations and Algorithms (2, 4, 25, 26, 31, 32)
4.3	Primes and Greatest Common Divisors (1, 2, 14, 15, 18, 21, 24, 32, 42)
4.4	Solving Congruences (1–4, 5, 10, 11, 16, 20, 21, 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, 4, 10, 12)
6.	**Counting**
6.1	The Basics of Counting (1–4, 10, 12, 18, 21, 22, 30, 33, 34, 46, 52)
6.2	The Pigeonhole Principle (1–4, 9, 16, 31, 33)
6.3	Permutations and Combinations (1–8, 18, 19, 23–26, 28, 34)
9.	**Relations**
9.1	Relations and Their Properties (1–4, 6, 12, 19, 28, 30, 34)
9.5	Equivalence Relations (1, 2, 9, 15, 16, 25, 36, 44)