SUNY Old Westbury, Fall 2023

MA 3030 Discrete Mathematics

Syllabus

(Last revised: August 29, 2023)

Instructor: Yogesh More

Email: morey@oldwestbury.edu

Class meeting times: 9:40 am - 11:10 am MW

This course will include additional opportunities for student learning and direct instruction, such as YouTube videos by Prof. David Ralston

---

Zoom link for class meetings:

see Brightspace

Office Hours:

via Zoom, Friday 3pm-6pm. Email in advance to confirm.

Course description:

From the course catalog: An introduction to discrete mathematical structures. Topics propositional and predicate logic, set theory, relations and functions, induction and recursion, algorithms and number theory, and graphs and trees

My addendum: This course is NOT about facts (which are easy to learn), but it is about (careful) *thinking*, which takes more time to learn. In other words, the *answers* are not as important as thinking involved in *getting to the answers*. It is the process not the destination. Understanding this is critical to your success in the course.

Course Objectives:

- Critical and Independent Thinking: Learn to THINK deductively, logically, mathematically, and independently, as opposed to memorizing and parroting information/facts that are told to you. Here is a quote I recently came across by Peter Gray, a professor of psychology at Boston College:

> My primary goal as a professor was to encourage critical thinking. Our testing and grading system has trained students not to think, but to memorize and regurgitate. Critical thinking is play; memorizing and regurgitating are not. Critical thinking is playing with ideas. We turn them upside

> down to see what happens, contrast them with other ideas to look for consistencies or contradictions, try them out on other people to get their reactions, and so on. Students come into the class believing they don't have permission to think. They are mere students, so their job is to "learn," not think, and learning means memorizing and regurgitating. To disrupt this ingrained schoolish habit and encourage thinking I developed what I call the idea approach to organizing a course." - Peter Gray, Professor of Psychology, Boston College in Forbes and Thomas. *Professors at Play Playbook*. Carnegie Mellon Press (2023)

Textbook:

Active Introduction to Discrete Mathematics and Algorithms, v. 3.0, by Charles Cusack

This text is an open educational resource (OER) and in particular, is freely available in PDF format at the author's webpage:

https://cusack.hope.edu/Notes/Notes/Books/AIDMA/AIDMA.3.0.pdf

As the word "Active" in the title suggests, this is a **workbook**, not (just) a textbook.

You will have more fun in the course if you view the 'assignments' as intellectual *play* and puzzles that challenge the mind, not as tedious tasks to get through. (And that is how I personally view mathematics and why I work on math for fun.)

Supplementary Resources:

- Discrete Mathematics with Applications | 5th Edition | Susanna S. Epp Cengage Publisher, 2020
- My notes when I taught this course out of Epps' textbook: **Lecture Notes**: https://github.com/morey-ow/ma3030-fall2023/blob/master/3030-lecture%20notes.pdf **Slides**: https://github.com/morey-ow/ma3030-fall2023/blob/master/3030-slides.pdf
- A Spiral Workbook for Discrete Mathematics by Harris Kwong (OER) https://milneopentextbooks.org/a-spiral-workbook-for-discrete-mathematics/
- Prof. David Ralston's YouTube playlist for the course: https://youtube.com/playlist?list=PLYPU-RArkLZOu7j172N2ZDDUxw4XgE5X2&si=NclIC7kO1vQygbGZ

Course Website:

Course Materials: https://github.com/morey-ow/ma3030-fall2023

Brightspace/D2L: mylearning.suny.edu

Schedule

(Tentative)

Week 1

Wednesday August 30, 2023

- Introduction to the course
- 2.1 Propositional Logic

Week 2

Monday September 4, 2023

Labor Day, no class

Wednesday September 6, 2023

- 2.2 Propositional Equivalence

Week 3

Monday September 11, 2023

- 2.3 Predicates and Quantifiers

Wednesday September 13, 2023

- 2.4 Normal forms
- 2.5 Reading Comprehension Questions
- 2.6 Problems

Week 4

Monday September 18, 2023

- 3.1 Direct Proofs
- 3.2 Implication and Its Friends

Wednesday September 20, 2023

- 3.3 Proof by Contradiction
- 3.4 Proof by Contrapostion

Week 5

Monday September 25, 2023

- 3.5 Other proof techniques
- 3.6 If and only if proofs

Wednesday September 27, 2023

- 3.7 Common Errors in Proofs
- 3.8 More Practice

Week 6

Monday October 2, 2023

- 3.9 Reading Comprehension Questions
- 3.10 Problems

Wednesday October 4, 2023

- 3.10 Problems

Week 7

Monday October 9, 2023

Columbus/Indigenous Peoples Day, no class

Wednesday October 11, 2023

- 4.1 Sets
- 4.2 Remainders and Rounding

Week 8

Monday October 16, 2023

- 4.3 Functions

Wednesday October 18, 2023

- 4.4 Partitions and Equivalence Relations
- 4.5 Reading Comprehension Questions

Week 9

Monday October 23, 2023

- 4.6 Problems

Wednesday October 25, 2023

- 6.1 Sequences

Week 10

Monday October 30, 2023

- 6.2 Sums and Products
- 6.3 Reading Comprehension Questions

Wednesday November 1, 2023

- 6.4 Problems

Week 11

Monday November 6, 2023

- 8.1 Mathematical Induction

Wednesday November 8, 2023

- 8.1 Mathematical Induction
- 8.2 Recursion

Week 12

Monday November 13, 2023

- 8.3 Solving Recurrence Relations

Wednesday November 15, 2023

- 9.1 Sum and Product Rules

Week 13

Monday November 20, 2023

- 9.2 Pigeonhole Principle

Wednesday November 22, 2023

- 9.3 Permuations and Combinations

Week 14

Monday November 27, 2023

- 9.4 Binomial Theorem

Wednesday November 29, 2023

- 9.5 Inclusion-Exclusion

Week 15

Monday December 4, 2023

10.1 Types of Graphs 10.2 Graph Terminology

Wednesday December 6, 2023

10.3 Some special graphs 10.4 Handshaking Lemma

Week 16

Monday December 11, 2023

10.5 Graph Representation 10.6 Problem Solving with Graphs

Final Exam Week

Wednesday December 13- Tuesday December 19, 2023

Individual 90 min oral exam, in addition it may include a written component.

Assignments/Grading

I have been gradually adopting alternative grading strategies, for instance as described in the recent books *Ungrading* by Susan Blum and *Grading for Growth* by David Clark and Robert Talbert. Some of the wording in this section on grading is taken verbatim from a syllabus by James Thomas (a sociology professor at the University of Mississippi) who follows alternative grading strategies.

If you have a question about math, e.g. some answer you have is correct, I'm happy to talk to you and give you feedback. But if you are motivated by grades and are not interested in learning the course material, I don't think this is the course for you. I cannot stand students who constantly ask about their grades. They tend to be weak students. **Every second spent thinking about grades comes with a cost - that is a second that can't be spent thinking about math.**

For various reasons, I have abandoned giving timed written exams, for better or worse.

(The following wording is taken from a syllabus by Prof. James Thomas)

> This course emphasizes qualitative rather than quantitative assessment. You will receive a final grade at the end of the term, but I will not be grading individual assignments in the traditional sense. Rather, I will ask you questions about your work, and make comments meant to engage you and your work rather than simply evaluate it. You will also be reflecting carefully on your own work.

Classwork I hope to limit the amount I lecture, and give you ample time in class to work through the workbook. I will ask you to submit on Brightspace what you work on that day. This will not be graded in a traditional sense, but should provide evidence you are engaging with the material. Late submissions will not be accepted.

Homework Assignments These will be problems from the book

Self-Assessments (Taken from a syllabus by Prof. James Thomas)

> As part of a mid-term or final exam, students will submit a self-assessment that conveys their own progress over the course of the semester for each of the learning objectives identified in the course.

Late work policy: Late work is not accepted. Turning in work on time shows engagement with the course material (which is part of the grade). Also it is just too hard to catch up if you fall behind.

Grading scale: (Taken verbatim from a syllabus by Prof. James Thomas)

A excellent mastery of course material; exceptional progress and/or growth across semester

B good mastery of course material; good progress and/or growth across semester

C moderate mastery of course material; moderate progress and/or growth across semester C-

D little mastery of course material; little progress and/or growth across semester

F no demonstrated mastery of the material; no progress and/or growth across semester

Participation You need to attend and be on task for all class sessions (but if there are one or two sessions you need to miss for legitimate reasons, that's fine, just email me beforehand). When I visit you in the breakout rooms, you should be able to talk to me and demonstrate evidence of a reasonable attempt at engaging with the material.

Final Exam One-on-one oral exam (over Zoom) scheduled sometime during the last week. I will ask you math questions related to course content. We will try to come to an agreement on your grade for the course.

The following, taken verbatim from James Thomas' syllabus, also applies:

> The university requires that each student receive a final grade at the end of the term. You will use my assessments of your work throughout the semester as a guide to assessing your own body of submitted work. Your final grade will be based on your own assessment of your submitted work and your progress and growth across the semester.

> In circumstances where my assessment of your work significantly departs from your own, I will override your assessment of your performance in class and assign your final grade myself.

Academic Integrity

Do not copy and submit answers you do not understand and can't explain. I reserve the right to meet on Zoom and ask you to explain your answers, and may give you an F for the assignment or course if you cannot reasonably explain an answer. In other words, don't turn in things just to turn in things.

I am **happy to give you the answer to any question** in the workbook, and the workbook itself has solutions to most problems. But you are cheating yourself if you just copy them, and you are **missing the point of the course** if you do so. **The point of the course is to learn to THINK, not to parrot information!**

The college's policy on academic integrity also applies to this course https://www.oldwestbury.edu/policies/academicresearch/policy-academic-integrity Here are some excerpts from that policy:

> As members of the Old Westbury community, students are expected to adhere to standards of honesty and ethical behavior. Plagiarism and other types of academic dishonesty are condemned at all academic institutions. These acts detract from the student's intellectual and personal growth by undermining the processes of higher learning and the struggle with one's own expression of ideas and information. Good academic procedure requires giving proper credit when using the words or ideas of others.

> Plagiarizing means "presenting somebody else's words or ideas without acknowledging where those words and ideas come from" (Ann Raimes, Keys for Writers, 7th ed., p.135). Examples include:
>
> - copying material from the Internet or other sources and presenting it as one's own
> - using any author's words without quotation marks; using any quotation without credit
> - changing any author's words slightly and presenting them as one's own
> - turning in any assignment containing material written by someone else (including tutor or friend); buying work and submitting it as one's own

> Know what plagiarism is and how to avoid it; for guidance see Raimes or any other college writing handbook.

Course Policy on Usage of AI Chatbots or Codelike ChatGPT, Bard, Bing, GitHub Copilot, etc.

AI Chatbots can be helpful in learning topics. However, they are just very articulate parrots, another description of the the technology is 'autocomplete on steroids'. There is no thinking involved.

AI Chatbots some times give inaccurate, incomplete, outdated, or outright false responses in an *extremely confident* tone, so use with caution and DO NOT BLINDLY TRUST THEM!

That being said, I allow their use in a limited and appropriate way - namely as a tool to help you learn. However they can also be used as a tool to avoid learning, to avoid engaging with the material, etc., and you are cheating yourself if you use tools this way.

Here are some appropriate ways to use them:

- if you can't resolve an error message, you can try asking an AI Chatbot to explain it
- You can ask it to test your understanding of course material: e.g. ask it to make up quiz questions on concepts you just learned
- Ask it to explain something

For this course, you must understand and be able to explain (at an appropriate level) any answers you submit, whether your answer is your own or you get it from classmate, internet, textbook, AI chatbots, etc.

Accommodations for students with disabilities

If you have or suspect you may have a physical, psychological, medical or learning disability that may impact your course work, please contact Stacey DeFelice, Director, The Office of Services for Students with Disabilities (OSSD), NAB 2065, Phone: 516-628-5666, Email: defelices@oldwestbury.edu. The office will help you determine if you qualify for accommodations and assist you with the process of accessing them. All support services are free and all contacts with the OSSD are strictly confidential. SUNY Old Westbury is committed to assuring that all students have equal access to all learning activities and to social activities on campus. https://www.oldwestbury.edu/academics/support/OSSD

Title IX, Sexual discrimination, harassment, and violence

SUNY Old Westbury prohibits sexual discrimination, harassment and violence, and will promptly respond to all complaints. The purpose of Title IX is to prevent sex discrimination on campus, address reported assaults and incidents, limit the effects of harassment on the educational environment, and prevent its recurrence. If you or someone you know believes they have been subjected to sexual discrimination, harassment or violence, help is available. To report or for more information please visit https://www.oldwestbury.edu/title-ix, please contact the Title IX coordinator, Deputy Title IX coordinator or University Police at 516-876-3333. Confidential resources and support is also available from the counseling professionals in the Counseling and Psychological Wellness Services department, located in the Student Union Lower Level Room LL100 (off the Rotunda) at 516-876-3053.

Dean of Students and Deputy Title IX Coordinator Student Union Suite 303 Phone: 516-876-3067

The syllabus is subject to change at the instructor's discretion to accommodate the needs of the class.