MTH 181-04 Discrete Mathematics I: MWF 10 AM

Instructor: Professor Adam O. Hausknecht	**Office**: I-394B
Phone:999-8322 (Math Dept. Office, 999-8316)	**Class Website**: www.math.umassd.edu/~ahausknecht/
Office Hours: MWF 4 PM - 5: PM and by appointment **via Zoom**	

Text: Susanna S. Epp, Discrete Mathematics, 5th Edition, Brooks-Cole, 2019 (Course Materials)
Homework: WebAssign**: Click the link on the MyCourses page for MTH 181-04**
Class Meetings: MWF 10 AM - 10:50 AM in LARTS 218.

Course Description

Credits 3. Lecture 3 hours per week. **Requirements:** Prerequisite: MTH 150 or MTH 153 or Placement of MTH 151. An introduction to mathematical reasoning, mathematical logic, and methods of proof. Topics include: properties of numbers, elementary counting methods, discrete structures, Boolean algebra, introduction to directed and undirected graphs, methods of proof, and applications in mathematics and computer science. This is the first semester of a discrete mathematics sequence designed for Mathematics, Computer and Information Sciences majors. This course fulfills the general education core requirements for Mathematics, Computer and Information Sciences majors who matriculated prior to Fall 2012 and has been approved by University Studies Curriculum for students matriculating in Fall 2012 or later.

Course Objectives

This course is designed primarily to provide the mathematical foundations with applications for students planning to take advanced mathematics courses, advanced computer science courses and advanced data science courses. During MTH 181, students will develop their ability to understand formal mathematical arguments and how learn how to write short mathematical arguments. The ideas of discrete mathematics are essential to understanding how computers and computer software operate. In fact, because computer programs are widely used in mathematics and computer science to preform numerical and combinatorial calculations or to recognize patterns, it is essential that mathematics, computer science, data science and engineering students have a solid background in the mathematics used to create such programs. In MTH 181, we will focus on mathematical reasoning (Mathematical Logic, Methods of Proof, Mathematical Induction), elementary number theory (prime numbers, factorization, the Greatest Common Divisor, the Division Algorithm for Integers, the Euclidean Algorithm, sequences). Applications of logic to the correctness of computer programs will be presented. The application of number theory to the computer representation of integers, encryption and the use of recursion to generate patterns will also be covered. On completion of this course, students should be able to

1. Demonstrate a basic level of competence in the use of discrete mathematics and formal logic tools.
2. Retain solution strategies and rigorous proof strategies for other upper-level STEM disciplines.

Topics: In MTH 181, we will cover selected material from Chapters 1, 2, 3, 4, 5, 6, and 9 (if time permits).

Course Materials

Required: Standalone WebAssign for Discrete Math only
ISBN: 9780357035252: *Discrete Mathematics with Applications*, Fifth Edition
Susanna S. Epp – Cengage.

If you are taking more classes using Cengage books in the fall semester (such as Calculus 1) or in future semesters, Cengage you have the option to purchase a **Cengage Unlimited Subscription** that gives you access to Cengage's entire catalog of texts and online platforms. Here are some options:

Cengage Unlimited, 1 term (4 months) for $124.99. ISBN 9780357700006.
Cengage Unlimited, Multi-Term (12 months) for $189.99. ISBN 9780357700013.
Cengage Unlimited, Multi-Term (24 months) for $239.99. ISBN 9780357700020.

Homework, Quizzes and Worksheets

Homework:

- Homework will be given online using WebAssign.
- You will be able to access WebAssign through MyCourses without using a class ID.
- You will need to buy an access code to use WebAssign. The access code will be included on a card if you purchase your textbook in a hard copy bundle. Do not throw away your WebAssign Access Code card. If you are not purchasing the hard copy text, you mat obtain an access code on-line at WebAssign or the campus bookstore.

Quizzes and Worksheets:

- Four to six quizzes will be given.
- There may be several worksheets given, sometimes in place of a quiz. They will be posted and submitted on MyCourses. They will include problems that require you to write complete solutions **neatly** either by hand or typed using a text editor such as LibreOffice, Pages or MS Word.
- It is possible that a worksheet will be a short programming assignment .
- If we are forced to move online, it is likely that won't be able to assign worksheets because of time constraints

Homework Extension Policy

- **You can request an extension while working on an assignment or within 7 days after the assignment's original due date**.
- You need to click **Extension Request**. Click the **Automatic** tab, if necessary. Please read carefully the following table:

Length of Extension	You will have 7 days to complete the assignment after the extension request is made.
Requests per Assignment	A 50% of the point value of the questions answered correctly after the extension is granted, *No penalty is applied if no more questions are answered correctly.* For example, assume (at the due date) you have earned 100 out of 200 points. If after having requested the extension you earned 80 more points, then your final score would be $100 + 80/2 = 140$ points out of 200 points.
Extension Period Closes	You have *7 days* after the assignment's original due date to request an automatic extension.

- If you accept the terms of the extension, click **Accept Automatic Extension**. Otherwise, click **Cancel.**

Course Communication

- Official course communication will be via email. Important announcements may also be posted on MyCourses as well. You are responsible for all the official communication sent to your university email address (———).@<u>umassd.edu</u>.

<u>**Classroom Policy**</u>

• Attendance and timely arrival to all classes is expected. You are expect to be fully prepared and on time and remain on task throughout the class meeting! Attendance and timely arrival to all class meetings will be expected even if we are forced to move online and hold classes via Zoom. Participation is expected although I may need to unmute you or you may need to submit a question via the Chat window or by virtually raising your hand. I may also divide the class into groups assigned to virtual rooms to work on a problem.

• If you miss a class meeting, you are responsible for taking the initiative in making up the all work. If you miss more than 3 class meetings, you are subject to a reduction of your grade, withdrawal from the course or receiving an **F** as your course grade.

• Use office hours or the STEM tutoring center as needed. I expect you to know and understand the material presented during class meetings, in homework and in worksheets. If you don't understand, seek help extra early. There is not much I or anyone can do to help you the day before an exam.

• Extended absences for medical or personal reasons must be reported to the **Student Affairs Office** and will be dealt with on a case-by-case basis.

• Absence for religious reasons will be handled in accordance with

> www.umassd.edu/policies/active-policy-list/students/absence-from-class-for-religious-observances/

• <u>Students with disabilities</u>: In accordance to University policy, if you have a documented disability and require accommodations to obtain equal access in this course please contact me at the beginning of the semester and provide the appropriate paperwork form the **Center for Access and Success (CAS)**. The necessary paperwork is obtained when you bring or send proper documentation to the **CAS** which is located in Pine Dale Hall, Room 7136; 508-999-8711; www.umassd.edu/dss/**.**

• <u>Academic and Ethical Standards</u>: This course requires you to follow the requirements of the **Academic Ethical Standards** as stated in
www.umassd.edu/policies/active-policy-list/academic-affairs/academic-integrity-policy-and-reporting-form/

I may decide to conduct a Zoom interview of a student that I suspect violated UMass Dartmouth Academic Ethical Standard as described in the link above. If we are forced to move online, it is also possible that I will use the proctoring software such as Honorlock if I deem it necessary to preserve Academic Ethical Standards.

<u>**Grading Policy**</u>

Homework-Quizzes-Worksheets: 15%   (*This may change if we are forced to move fully online via Zoom*)
Exams 1-2-3 (20% each):   60%   (*During class meetings*)
Final: <u>25%</u>   (*During the scheduled Final Exam Period*)
                                100%

☞   Your course grade will be determined by your class average a shown in the table below**:**

Class	Grad	Class	Grade	Class	Grade	Class	Grade
98% ≤	A+	87-89%	B+	77-79%	C+	67-69%	D+
90-92%	A−	80-82%	B−	70-72%	C−	60-62%	D−
93-97%	A	83-86%	B	73-76%	C	63-66%	D
						≤ 59%	F

Office Hours

I've tentatively scheduled office hours for MWF 2 PM - 3 PM and also by appointment. The time of the scheduled office hours will likely need be changed to accommodate as many of the students as possible in all of my courses. I will inform you via email of any change. Of course, you can also seek tutoring at the **STEM Learning Lab (**https://www.umassd.edu/arc/stem-learning-lab/**)**.

Advice and General Remarks

1. **You need to read the eText that is accessible from Webassign!** I can't cover the details of every example during class meetings. You also can purchase an inexpensive printed copy from Cengage.
2. Read sections *before* they are discussed in class. Don't expect to understand a passage, example, or proof on the first reading. If you are *not* confused by a passage, it is very likely you are *not* learning anything new!
3. Read a mathematics text actively with pencil and paper in hand! This means:
   - Read the body of a section carefully *before* attempting to work its exercises and problems,
   - Do the section's examples (without first looking at their solutions), and
   - Try to solve a section problem *without* finding a similar example and using it as a model. Only look for such an example when you are genuinely stuck. The idea is to use the section's exercises and problems as a self-test for what you learned by reading the section.

   Reading the text *actively* takes time but is the *only way* to truly learn mathematics. To learn to dance, you need to get up and dance! To learn to play a musical instrument, you need to practice! To learn to draw, you must draw! The same is true for mathematics. There is no magic short-cut.
4. *Learn definition*s! This is very important as you will quickly become completely lost if you don't understand the mathematical words, terms and notation that are used throughout the course. Make and use flash cards if necessary!
5. *Keep up!* Once you fall behind, it is often very difficult or impossible to catch up!
6. Discuss the examples and problems with your classmates **BUT** submitted work must be written up by you alone! Note: Brief answers for many problems are included in the eText.
7. In class, don't write down every word I say or write! Rather pay attention to the class discussion and ask questions about points you don't understand. Of course, this is only possible if you read ahead!
8. When presenting a solution to a problem, I expect you to *show your wor*k and/or *justify* your answer.
9. Seek help early by attending office hours or tutoring sessions at the STEM Learning Lab

   (https://www.umassd.edu/arc/stem-learning-lab/). *Don't wait until the day before an exam!*

MTH18104 Tentative Course Outline Fall2022	
Week 1: August 29 – September 2, 2022	
Introduction	
Chapter 1	
Section 1.1: Variables	**WebAssign Hw 1.1 Due by Sunday 9/11, 11:59 pm**
Section 1.2: The Language of Sets	**WebAssign Hw 1.2 Due by Sunday 9/11, 11:59 pm**
Week 2: September 5 – September 9, 2022 (Monday 9/5/22 Labor Day - No Classes)	
Section 1.2: The Language of Sets **Chapter 2** **Section 2.1**: Logical Form & Logical Equivalence **Section 2.2**: Logical Form & Logical Conditional Statements	**Background Quiz** **WebAssign Hw 2.1 Due by Sunday 9/18, 11:59 pm** **WebAssign Hw 2.2 Due by Sunday 9/18 11:59 pm**
Week 3: September 12 – September 16, 2022	
Section 2.2: Logical Conditional Statements **Section 2.3**: Valid and Invalid Arguments	**Quiz 1 Monday, Monday, September 12** **WebAssign Hw 2.3 Due by Sunday 9/25, 11:59 pm**
Week 4: September 19 – September 23, 2022	
Chapter 3 **Section 3.1**: Predicates & Quantified Statements I **Section 3.2**: Predicates & Quantified Statements II	**Quiz 2 or Worksheet, Monday, September 19** **WebAssign Hw 3.1 Due by Sunday 9/25, 11:59 pm** **WebAssign Hw 3.2 Due by Sunday 10/2, 11:59 pm**
Week 5: September 26 – September 30, 2022	
Mon Sept-26 Exam 1 **Section 3.3**: Predicates & Quantified Statements I **Section 3.4**: Predicates & Quantified Statements II	**Review Sheet For Exam 1 will be posted** **WebAssign Hw 3.3 Due by Sunday 10/2, 11:59 pm** **WebAssign Hw 3.4 Due by Sunday 10/9, 11:59 pm**
Week 6: October 3 – October 7, 2022	
Chapter 4:	**Quiz 3 or Worksheet Tuesday, October 3**
Section 4.1: Direct Proof & Counterexample I: Introduction	**WebAssign Hw 4.1 Due by Sunday 10/9, 11:59 pm**
Section 4.2: Direct Proof & Counterexample II: Writing Advice	**WebAssign Hw 4.2 due by Sun 10/16 by 11:59 PM**

Week 7: October 10 – October 14, 2022
Monday 10/10/22 – Columbus-Indigenous People's Day No Classes!
Tuesday 10/11/22 – Follow Monday's Schedule

Section 4.2: Direct Proof & Counterexample II: Writing Advice	**Quiz 4 or Worksheet Tuesday, October 11**
Section 4.3: Direct Proof & Counterexample III: Introduction to Rational Numbers	**WebAssign Hw 4.3 due by Sun 10/16 by 11:59 PM**
Section 4.7: Indirect Argument Contradiction and Contraposition	**WebAssign Hw 4.7 due by Sun. 10/23, 11:59 pm**

Week 8: October 17 – October 21, 2022

Mon Oct-17 Exam 2	**Review Sheet for Exam 2 will be Posted**
Section 4.7: Indirect Argument Contradiction and Contraposition	
Section 4.8: Indirect Argument: Irrationality of $\sqrt{2}$	**WebAssign Hw 4.8 due by Sun. 10/23, 11:59 pm**
Chapter 6	
Section 6.1: Set Theory: Definitions & the Element Method of Proof	**WebAssign Hw 6.1 due by Sun 10/30, 11:59 PM**

Week 9: October 24 – October 28, 2022

Section 6.1: Set Theory: Definitions & the Element Method of Proof	
Section 6.2: Properties of Sets	**WebAssign Hw 6.2 due by Sud. 10/30, 11:59 pm**

Week 10: October 31 – November 4, 2022

Section 6.2: Properties of Sets	**Quiz 5 or Worksheet Monday 10/31**
Section 6.3: Disproofs & Algebraic Proofs	**WebAssign Hw 6.3 due by Wed. 11/6 11:59 pm**
Chapter 5	
Section 5.1: Sequences	**WebAssign Hw 5.1 due by Sun. 11/6, 11:59 pm**
Section 5.2: Mathematical Induction: Proving Formulas	**WebAssign Hw 5.2 due by Sun. 11/13, 11:59 pm**

Week 11: November 7 – November 11, 2022
Wednesday 11/9 Follow Friday's Schedule Friday 11/11/22 Veteran's Day – No Classes

Section 5.2: Mathematical Induction: Proving Formulas	**Quiz 6 or Worksheet Monday 11/7** **WebAssign Hw 5.2 due by Sun. 11/13, 11:59 pm**
Section 5.3: Mathematical Induction: Applications	**WebAssign Hw 5.3 due by Wed. 11/20, 11:59 pm**
Section 5.6: Defining Sequences Recursively	**WebAssign Hw 5.6 due by Wed. 11/20, 11:59 pm**

Week 12: November 14 – November 18, 2022

Mon 11/14 Exam 3	**Review Sheet for Exam 3 will be Posted**
Section 5.6: Defining Sequences Recursively	
Section 9.1: Introduction to Probability	**WebAssign Hw 9.1 due by Wed. 11/30, 11:59 pm**

Week 13: November 21 – November 25, 2022
Wednesday, November 23 , 2022 Thanksgiving recess begins after last class

Section 9.1: Introduction to Probability **Section 9.2** Possibility Trees and the Multiplication Rule	**WebAssign Hw 9.2 due by Wed. 11/30, 11:59 pm**

Week 14: November 28 – December 2, 2022 Classes Resume

Section 9.3: Counting Elements of Disjoint Sets: The Addition Rule	**If time permits, Quiz 7 or Worksheet, Mon 12/5**
Section 9.4: The Pigeonhole Principle	**WebAssign Hw 9.3 due by Wed 12/7, 11:59 pm**
Section 9.7*: Pascal's Formula and the Binomial Theorem	**WebAssign Hw 9.4 due by Wed 12/7, 11:59 pm** **WebAssign Hw 9.7 due by Wed. 12/7, 11:59 pm**

Week 15: December 5, 2022 (Wednesday 12/7 The last class meeting of MTH 181-04)

Final Wednesday 12/14/2022, 8 AM – 11 AM	**Review Sheet For Final Posted**

This syllabus is a guide and every attempt has been made to provide an overview of this course. However, circumstances and events may make it necessary for me to modify the syllabus during the semester and may depend in part on the progress, the needs and the experiences of the students as well as unforeseen events. Significant changes to the will be announced.