

MTH 180: Mathematical Tools for Computing - Fall 2019

University of Rhode Island

Instructor: Nikolas Townsend

Office: Lippitt Hall 106C

Email: townsendn@uri.edu

Class Schedule: TuTh 9:30 - 10:45am, Pastore Hall, Room 305

Office Hours: (Tentative!) TuTh 1-2pm, M 12-1pm

Description: The course introduces basic mathematical tools and formal methods of reasoning used in computing. Each topic will be motivated and connected to computer science applications. The course puts emphasis on problem solving and applications. Topics include propositional logic, proofs, recursion, elementary number theory, counting, and linear algebra.

To succeed in MTH 180, you need to have basic familiarity with arithmetic and algebra. The course does not require any higher math as a prerequisite; only high school algebra. Complex numbers, calculus, limits are not necessary. Here is a list of skills I will assume you have:

- Multiplying polynomials.
- Manipulating equalities (i.e. $2x + 3 = 5$).
- Adding, subtracting, multiplying, and dividing fractions.
- Working with exponents and roots.
- Basic categorizing of types of numbers (integers, rationals, real numbers).
- Manipulating inequalities.

Textbook: Susanna S. Epp, Discrete Mathematics with Applications, 5th Edition, Cengage Learning, <https://www.cengage.com/c/discrete-mathematics-with-applications-5e-epp/> with an access to the *WebAssign* online homework system.

The textbook is available in the URI bookstore as well as online on the publisher's website and websites of other booksellers. There are several options you can consider to obtain the textbook together with an access code for WebAssign. Please see the **Homework** section of the syllabus for more information about WebAssign.

1. The ISBN for WebAssign only is 9780357035252, WebAssign contains an access to the e-book if you prefer to read our textbook from a screen. **This is the most economical option.**
2. The ISBN for the loose-leaf edition and WebAssign is 9780357097724.
3. The ISBN for the bound book with WebAssign is 9780357097618. This is the priciest option, costing considerably more than options 1 and 2.

Remark: If you are using a textbook published by Cengage in another course you are taking this semester, you might want to explore 'Cengage Unlimited'. Cengage Unlimited gives you an access to Cengage's entire catalogue (which would include the e-book and WebAssign). If you are taking multiple courses with Cengage textbooks, this would be the most economic option (www.cengage.com/unlimited/).

General education areas and learning outcomes: MTH 180 is a general education course. The general education areas satisfied by MTH 180 are:

- **A1:** Scientific, Technology, Engineering, and Mathematical Disciplines (STEM).
- **B3:** Mathematical, Statistical, or Computational Strategies (MSC).

At the conclusion of this semester you will understand the following:

1. Logic statements, mathematical logic and set notation, and basic proofs.
2. Sum notation and recurrences and be able to apply them to analysis of algorithms.
3. Concepts of graphs and their applications to algorithms and networks.
4. Basic properties of matrices and vectors, as well as their computer science applications.
5. Basic algorithmic problems using the mathematical concepts covered in the course.
6. Improve your problem solving skills and effective communication of your solutions.
7. Be able to do calculations using modular arithmetic.

Instructional Protocol: I will expect you to come prepared for class as will be discussed in class during the semester. Attendance and participation during the class will be vital to the learning process. Not everything you should gain from this course can be taught during our class meetings. Much of your learning must take place outside of the classroom. Based on experience at a minimum you should plan on studying two or more hours outside the classroom for each our in class. You are expected to read relevant sections of the textbook for comprehension. The text gives a detailed account of the material of the course. If contains more examples of the concepts being discussed, and these should be used to supplement the examples you see in class.

Exams: There will be three exams during the semester tentatively scheduled for Thursday October 10, Thursday October 31, and Tuesday November 26. The first and third exams will be in-class and the second exam will be take-home. A comprehension final exam will be given during the final exam period as scheduled by the Enrollment Services, <https://web.uri.edu/enrollment/final-exam-schedules/>. The exams are closed books and no notes are allowed. Please plan your end-of-semester travel accordingly since you will not be able to take the final exam at any other time.

Homework: We will have regular homework assignments; typically on a weekly basis. Each homework assignment will have an online (*WebAssign* online homework system) and a written part. The homework assignments will be graded. Working on the homework problems is important for deepening your understanding and a part of preparing for exams. You learn more by doing than by watching others give demonstrations. Therefore, *homework is very important*. When you work on homework is when you realize whether or not you understood the material presented in class. I am happy to give hints if you get stuck and go over solutions of particularly difficult problems in class. I will drop the lowest homework score for you at the end of the semester. To keep the class running smoothly, late homework will not be accepted.

WebAssign registration: To register for our section on WebAssign:

1. Go to www.GetEnrolled.com.
2. Enter the Class Key: uri 1096 4908.
3. Follow the on-screen instructions to complete your WebAssign registration.

After you register, you can access WebAssign at <https://www.webassign.net/>.

Evaluation: Your grade will be determined based on your homework, the three exams, and the final exam in the following way: homework 20%, each exam 20%, the final exam 20%. There will be no additional extra credit. A rough guideline is as follows: A (93.00-100%), A- (90.00-92.99%), B+ (87.00-89.99%), B (83.00-86.99%), B- (80.00-82.99%), C+ (77.00-79.99%), C (73.00-76.99%), C- (70.00-72.99%), D+ (67.00-69.99%), D (60.00-66.99%), F (59.99% and below).

- *Missed exams:* Make up exams will be given only in the case of severe illness, other extreme emergency, or an approved scheduling conflict on the day of the exam. You must notify your instructor before, not after, the exam, and emergencies require you to contact your instructor within 24 hours. If you do not take an exam and I have not heard from you within 24 hours of the exam (in case of emergency), you will receive a zero for the exam.
- *Incompletes:* University policy on “incomplete” grades will be strictly applied. As per University policy, grades of I (incomplete) are given at the discretion of the instructor for documented, University-approved reasons only. Note that incomplete may only be given if the work in the course up until the documented problem is passing (60% or higher) by University policy. See sections 8.53.20 and 8.53.21 of the university manual.

Post-assignment review: Any requests for regarding of either homework or exams must be brought to my attention within two weeks of the item’s return in class.

Course Materials: All class materials (e.g. notes, slides, exams, videos, etc.) are property of URI and the instructor. Copying, video taping, taking pictures, or posting this material is not allowed without consent of the instructor and URI.

Standards of Behavior: You are here to learn, so please give class your full attention, ask questions if you do not understand a concept, and be respectful and courteous to your fellow students and instructor. Students are responsible for being familiar with and adhering to the published “Community Standards of Behavior: University Policies and Regulations”, which can be accessed in the University Student Handbook. If you must come into class late, please do not disrupt the class. Please *turn off* all cell phones, laptops, tablets, etc. if they are not being used for note-taking.

Accommodations: Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with the Disabilities Services for Students Office in 330 Memorial Union, 401-874-2098.

Class Attendance: Class attendance is *expected and strongly encouraged*. You are responsible for everything in class; anything announced in class, any material covered, handouts, assignments, etc., i.e. it is your responsibility to make sure you are aware of what takes place in the class.

Illness due to flu: If anyone develops flu-like symptoms, we are advised to stay home until the fever has subsided for 24 hours. So, if you exhibit such symptoms, please do not come to class. Notify me via email with proper documentation, and we will work together to ensure that course instruction and work is completed for the semester. The Centers for Disease Control and Prevention have posted simple methods to avoid transmission of illness. For more information, please visit www.cdc.gov/flu. The URI Health Services web page, www.health.uri.edu will carry advice and local updates.

Getting Help: Regular study and practice with the course material is imperative for success in this class. In addition to your instructor's office hours, the Academic Enhancement Center's (www.uri.edu/aec, 874-2367) Walk-In-Tutoring will help you with this. The Walk-In Tutoring Center is a no-appointment-needed tutoring center where you can work with tutors and other students in this and other math courses. They provide free support in all math courses up to MTH 243. Bring your book, notes, and questions with you. Tutoring is a great place to practice with classmates and friends, prep for exams, and review what we are learning in class. You are also encouraged to discuss class material with other students in the class.

Important Dates:

- Open add period: Sept 4-10, 2019.
- Open drop period: Sept 11-26, 2019. No mark on transcript.
- Additional drop period through E-Campus: Sept 27-Oct 17, 2019. "W" on transcript.

A course may be dropped by official procedures determined by the Office of Enrollment Services (E-Campus) on or before the end of the third week of classes (Drop Period) with no mark on a student's transcript. Courses may be dropped through E-Campus between the fourth week and the end of the sixth week of classes (Withdrawal Period) and will be recognized on a student's transcript with a "W". After the end of the sixth week (Late Withdrawal Period), a student may drop a course only in exceptional circumstances and only with authorization of the dean of the college in which the student is enrolled. Such drops will also be recognized on a student's transcript with a "W". If a student has not dropped a course by the end of the withdrawal period, the instructor must submit a grade.

Course Calendar: The following calendar gives a rough timetable for the course together with a list of sections in the textbook. Some sections will be covered only partially. We might be slightly ahead or behind at any given time.

Week	Information/Events	Topics/Sections
Sept 2	Class Starts Th Sept 5	Introduction, sets (1.2)
Sept 9		Relations, functions, propositional logic (6.1, 1.3, 2.1)
Sept 16		Conditional statements, predicates (2.2, 3.1)
Sept 23		Direct proof, analogy to algorithms (4.1, 4.3, 4.6)
Sept 30		Proof by contradiction, sequences (4.7, 5.1)
Oct 7	Exam 1 , Th Oct 10	Mathematical induction (5.2)
Oct 14	Monday classes meet Tuesday	Sequences and recursion (5.6, MU puzzle)
Oct 21		Recursion, functions (5.7)
Oct 28	Exam 2 , Th Oct 31	Counting, multiplication rule (9.2)
Nov 4		Counting, inclusion-exclusion principle (9.3, 9.5)
Nov 11		Graphs (1.4, 4.9, 10.1)
Nov 18		Graph trees (10.4)
Nov 25	Exam 3 , Tu Nov 26, No classes Nov 27-29	
Dec 2		Matrix representation of graphs, matrix algebra
Dec 9	Class ends Tu Dec 10	Review