

(CSC / MTH) 547: Combinatorics Spring 2018

University of Rhode Island

Instructor:	Dr. Michael Barrus
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Office Hours:	TWTh 2 – 2:50 pm; other times by appointment
Class Days/Time:	TuTh 11 am – 12:15 pm
Classroom:	Lippitt Hall 201
Prerequisites:	MTH 316 ([Abstract] Algebra)

Course Description

Enumeration: generation functions, recurrence relations, classical counting numbers, inclusion-exclusion, finite set systems and designs. Polya theory, coding theory, and Ramsey theory. Finite fields and algebraic methods. – *2017-2018 URI Undergraduate & Graduate Catalog*

Course Goals

Students will gain familiarity with fundamental topics, techniques, and algorithms of discrete mathematics through experience with modeling and solving problems.

Student Learning Outcomes

A more specific list of learning outcomes will be created throughout the semester and made available in Sakai.

Required (or at least Recommended) Text

Combinatorics: Topics, Techniques, Algorithms by Peter J. Cameron (ISBN-13: 978-0521457613). The course will follow the text in its presentation of selected topics, though homework assignments will be distributed directly by the instructor and not necessarily assigned from the text. Please note that a copy of the text may be checked out from the University Library reserves (at the circulation desk)

for in-library use for a term of 2 hours (if you do not have access to a personal copy of the text, please take advantage of this!). Please make an effort to consult the textbook regularly throughout the semester; while I make an effort to make each class period as helpful as possible, most material in the course cannot be presented completely, or digested perfectly, in one sitting, and you will likely need to return to written resources many times—this is the nature of advanced mathematics.

Tentative Schedule

The following plan for the semester may need to be modified several times—changes will be announced in class as we proceed.

Dates	Topics discussed/important dates
Jan. 23, 25	Course intro; Chapter 2: On numbers and counting
Jan. 30, Feb. 1	Chapter 3: Subsets, partitions, and permutations
Feb. 6, 8	Chapter 3, continued
Feb. 13, 15	Chapter 4: Recurrence relations and generating functions
Feb. 20, 22	Chapter 5: The principle of inclusion and exclusion
Feb. 27, Mar. 1	Chapter 6: Latin squares and SDRs; Chapter 7: Extremal set theory
March 6, 8	Midterm exam
March 13, 20	Spring break (no classes)
March 20, 22	Chapter 8: Steiner triple systems
March 27, 29	Chapter 9: Finite geometry
April 3, 5	Chapter 10: Ramsey's Theorem
April 10, 12	Chapter 15: Enumeration under group action
April 17, 19	Chapter 16: Designs
April 24, 26	Chapter 17: Error-correcting codes

Classroom Protocol

No points will be attached to attendance in computing course grades, though attendance and participation during class will be vital to the learning process, and classroom activities will be designed to facilitate understanding, provide needed practice and clarify misconceptions.

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. As with most university courses, all class participants are expected to behave in a respectful and safe manner at all times throughout the semester. Please do your best not to inhibit the learning experience of anyone else, and please feel free to bring any issues you have with others' behavior to the attention of the instructor

(in a private manner, if possible). Issues that may arise will be dealt with in as respectful and confidential a manner as possible.

Grading Policy

Grades will be determined through a weighted average with categories and weights as follows:

- 50% Homework assignments
- 20% Midterm exam
- 30% Final exam

Each grade category's components and policies will be described in sections that follow. No other grading criteria or extra credit is anticipated for this course.

Letter grades for the course will be determined by considering your overall weighted percentage according to a standard scale, adjusted as necessary to account for class performance. If you have concerns about your grade at any point during the semester, please make an appointment to visit with me.

Homework assignments

Homework will be assigned approximately once a week, for a total of roughly 11 assignments. Dates may vary, but typically homework will be posted in Sakai each Thursday and collected during class the following Thursday. Unless otherwise specified, for full credit each assignment must be received by the end of class on the day it is due.

Solutions to all homework exercises must be clearly written with all necessary justification; a good write-up of your answer is just as important, usually, as a correct answer.

It is strongly recommended, though not required, that you typeset your homework using LaTeX. Typesetting your homework makes it easier for you to correct mistakes and makes it easier for me to read your work. In addition, some of the graduate mathematics courses at URI do require that homework be typeset, so it is to your advantage to learn LaTeX now. (If you are new to LaTeX, I suggest trying an online editor, such as ShareLaTeX.com or Overleaf.com, and beginning your education with [ShareLaTeX's "Beginners LaTeX Tutorial,"](https://www.youtube.com/watch?v=8mUgD868K00) a playlist on YouTube. You can also ask me for additional help.)

After your assignments are passed back to you, I am happy to discuss your graded work with you on a one-on-one basis. Any requests for regrading (on either homework or exams) must be brought to my attention within two weeks of the item's score being posted in the Sakai gradebook.

Late homework

Yes, **please** complete and submit homework even if it is late, and the sooner the better! In graduate classes in mathematics, it is through doing the homework that most of the learning usually happens. That said, for obvious reasons it is always to your advantage to stay caught up with the assignments, so I suggest that you start each problem set **early**, as soon as it is posted.

Late homework may be accepted up until 10 University class days after it is due, though the maximum possible percentage that may be earned will drop in increments of 10 percentage points each University class day after the original deadline. (For example, an assignment that is due Thursday but received the following Tuesday will be graded normally but will have its score capped at 70% of the assignment's possible value.) It is expected that when you miss turning an assignment in during class, you will do your best to submit it as soon as possible by sending a copy (photo, scan, or digital version) to my email, dropping it off at my office (leaving it under my door if I am not there to receive it), or leaving it at the Math Department office in 200 Lippitt Hall.

Please respect the homework deadlines and expect that I will strictly enforce them. By University policy, to be accepted for credit, all homework must be turned in by the last scheduled meeting time for our class before the final exam (barring snow days or other cancellations, our last class day should be April 26.)

Group work

Group work can be a wonderful thing, and I encourage it, subject to the following rules:

- **Group work is not allowed, in even the smallest way, on the midterm or the final exam.**
- Though you may discuss homework problems with others, you must do your own typing/writing while preparing your own answers to each problem, and you may not simply copy someone else's work verbatim.
- Never submit work of others that you do not understand; I consider this dishonest, and it is rarely beneficial to anyone's learning. Please seek help early (including from me) when you are stuck beyond your own ability, especially if a due date is drawing near.
- When you do receive help from a printed resource, be sure to clearly acknowledge that help with a statement on your homework.

Midterm exam

There will be one midterm exam to be given near the beginning of March. Exact date(s) and more detail on the format and content of the exam will be given

in class closer to the day of the exam. No notes, texts, calculators, or aids of any kind will be allowed on any exam without written instructions from the instructor. (Calculators are not expected to be that helpful, anyway.)

The best way to prepare for the midterm exam (and for the final) will be to frequently test yourself on assigned homework exercises and the associated concepts and theorems, particularly as they are stated in the Course Learning Outcomes document, which will be available in Sakai.

Final exam

The final exam will be comprehensive. Unless otherwise suggested by the instructor and agreed upon unanimously by the class, the exam will be offered in our classroom on **Thursday, May 3, from 8:00 to 11:00 am**. University policies concerning the final exam will be strictly adhered to. More information on the final will be given towards the end of the semester.

Accommodations for special needs

Section 504 of the Rehabilitation act of 1973 and the Americans with Disabilities Act of 1990 require the University of Rhode Island to provide academic adjustments or the accommodations for students with documented disabilities. The student with a disability shall be responsible for self-identification to the Disability Services for Students in the Office of Student Life, providing appropriate documentation of disability, requesting accommodation in a timely manner, and follow-through regarding accommodations requested. It is the student's responsibility to make arrangements for any special needs and the instructor's responsibility to accommodate them with the assistance of the Office of Disability Services for Students.

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 Disability Services for Students Office at 330 Memorial Union, 401-874-2098.

Academic honesty

All submitted work must be your own. If you consult other sources (such as, but not limited to, articles or books from the library, articles available through internet databases, or websites—including so-called “homework help” sites) these **MUST** be properly acknowledged and documented, or you will be charged with plagiarism/academic dishonesty and will receive a penalty for the assignment, up to and including a full loss of credit. In some cases, this may result in a failure of the course as well. In addition, the charge of academic dishonesty will be reported to the Office of Student Life. If you have any doubt

about what constitutes plagiarism, visit the URI Student Handbook and University Manual sections on Plagiarism and Cheating at <http://www.uri.edu/facsen/8.20-8.27.html>.

For example, unless you receive instructor authorization in writing, you may not receive help on exams from any source, and if you receive help as you complete a homework assignment, you should acknowledge that help on your assignment as described earlier in this document. If you are unsure about whether an action you have taken or are considering is academically honest, ***please ask*** (sooner, rather than later).

Inappropriate use of course materials

All course materials (e.g., outlines, handouts, syllabi, exams, quizzes, slideshows/presentations, lectures, audio and video recordings, etc., whether in tangible or digital form) are subject to copyright and licensing restrictions. In order to preserve the value of course materials and the educational experiences of later students, and to maintain appropriate copyright status for instructor creations, students are prohibited from posting online or selling any such course materials without express written permission from the instructor.

Religious holidays

It is the policy of the University of Rhode Island to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students desiring to observe a holiday of special importance must provide written notification to each instructor.