Math 300: Introduction to Mathematical Reasoning Course Syllabus

Virginia Commonwealth University
Fall 2023
Section 003
MW 1:00 - 2:15 pm
Harris Hall 3003

Instructor:

Brent Cody
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Office hours:

Wednesday 2:30 - 3:30 pm and Friday 1:00 - 2:00 pm
In Harris Hall 4110

Course description:

MATH 300. Introduction to Mathematical Reasoning. 3 Hours.
Semester course; 3 lecture hours. 3 credits. Prerequisite: MATH 201 with a minimum grade of C. An introduction to basic concepts of mathematical reasoning and the writing of proofs in an elementary setting. Direct, indirect and induction proofs. Illustrations of the concepts include basic proofs from mathematical logic, elementary set theory, elementary number theory, number systems, foundations of calculus, relations, equivalence relations, functions and counting with emphasis on combinatorial proofs.

Topics:

(1) **Sets** - Operations on sets, Venn diagrams, indexed sets, paradoxes
(2) **Logic** - Statements, truth tables, quantifiers, negating statements
(3) **Counting** - Counting, combinations, permutations, combinatorial proofs
(4) **Proving conditional statements** - direct proof, contrapositive proof, proof by contradiction
(5) **Proving other kinds of statements** - if-and-only-if proofs, existence proofs, uniqueness proofs, proofs involving sets, disproof
(6) **Mathematical induction** - induction vs. strong induction, the fundamental theorem of arithmetic, Fibonacci numbers
(7) **Proofs involving relations and functions** - equivalence relations, injective and surjective functions
(8) **Foundations of calculus** - the triangle inequality, proofs involving limits, continuity and derivatives
(9) **Cardinality of sets** - proofs involving infinite sets, some infinite sets are larger than others

Required textbook:

Book of Proof, Third Edition, by Richard Hammack
A free PDF of the textbook can be obtained on Richard Hammack's website:

https://www.people.vcu.edu/~rhammack/BookOfProof/

You can also buy a printed copy of the book at Amazon or Barnes and Noble.

Course website::

All course materials are on Canvas. To find our course website, log in to Canvas at the link below.

https://learningsystems.vcu.edu/canvas/

Student learning outcomes:

Students in this course are expected to learn how to:

- write mathematical proofs clearly, concisely and correctly;
- read and comprehend mathematical works;
- write prose about mathematics and
- construct mathematical proofs about advanced topics in pure mathematics at an undergraduate level.

Help with course material:

I enjoy talking to students, so please:

- ask questions in class,
- come talk to me in my office and
- send me email.

Free tutoring may also be available through the Campus Learning Center.

Expectations:

> "*For a student of mathematics to hear someone talk about mathematics does hardly any more good than for a student of swimming to hear someone talk about swimming. You can't learn swimming techniques by having someone tell you where to put your arms and legs; and you can't learn to solve problems by having someone tell you to complete the square or to substitute* $\sin u$ *for* y." —Paul Halmos

The only way to truly learn mathematics is to be actively engaged with it yourself. I therefore expect you to complete all assignments to the best of your ability. It is important that you stay up-to-date with the material being covered in the course; please make use of office hours or send me an email if anything covered in the course is not clear. If the scheduled office hours do not work for you, send me an email to schedule a meeting for a different time.

> In addition to attending the 2 hours and 30 minutes of lectures each week, I expect that you will spend at least 6 hours per week <u>outside of class</u> working on this course.

Grades:

The usual 10-point grading scale will be used to determine course grades (90–100 is an A, 80–89 is a B, etc.). Your final average in the course will be computed as follows.

Homework	15%
Quizzes	15%
Highest Test Grade	35%
Final Exam	35%
Total	100%

(1) Homework: There will be weekly graded homework assignments. Many problems will require that you write mathematical proofs in complete sentences. **All homework assignments must be submitted on Canvas in PDF format.** Photos taken with a cell phone will be fine, but you must combine them into a single PDF. I encourage you to work together on solving homework problems, but the work you submit must be your own. Do not copy solutions (of your classmates or of any other source) and submit them as your own—this will be considered cheating.

> The first homework assignment will be due on Wednesday, August 30.

(2) Quizzes: Timed quizzes will be administered in class.

> The first quiz will be on Wednesday, August 30.

(3) Tests: There will be two midterm exams before the final exam period, each of which I will announce at least one week in advance. Tests must be taken during class time (1:00 - 2:15 pm) on the day of the test.

(4) Final Exam: The final exam will be in-person and will take place on

> Monday, December 18, from 12:30 pm to 3:20 pm .

Grading and makeup policies:

Under normal circumstances I do not make a distinction between excused and unexcused absences. An absence of any type can impact your performance. **I do not give makeup quizzes or tests, nor do I accept late homework**. I will drop your lowest test grade, lowest homework grade and two lowest quiz grades. If you miss one test, then that counts as the dropped grade. If you miss the final exam for a legitimate reason (i.e. a documented illness or emergency) then I can give you a grade of Incomplete (I) for the course, and you will need to make up the missed exam.

Drop Policy:

Students who do not attend a single class meeting in the first two weeks of class may be dropped from the class.

Important Dates:

Monday, August 28	Last day of add/drop period
Friday, October 27	Last day to **withdraw** with a mark of "W".

For other important dates visit: https://academiccalendars.vcu.edu/.

University links and policies:

- VCU Syllabus Policy Statements on the Provost's Website
  https://faculty.provost.vcu.edu/faculty-resources/syllabus-statements/
- Use VCU Libraries to find and access library resources, spaces, technology and services that support and enhance all learning opportunities at the university. (https://www.library.vcu.edu/)
- Students should visit http://go.vcu.edu/syllabus and review all syllabus statement information. The full university syllabus statement includes information on safety, registration, the VCU Honor Code, student conduct, withdrawal and more.

Student accomodations:

VCU is committed to ensuring that all students maintain equal access to all aspects of the university, including educational experiences through the provision of reasonable accommodations and academic adjustments. In addition to being a requirement under Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, this speaks directly to VCU's mission of inclusion, equity, and access. To receive accommodations or other disability-related supports, students must register with the Office of Student Accessibility and Educational Opportunity on the Monroe Park Campus (828-2253) or the Division for Academic Success on the MCV campus (828-9782). Students and faculty can visit the Office of Student Accessibility and Educational Opportunity website and/or the Division for Academic Success website for additional information. Once students have completed the registration process, they will be provided with a letter of accommodation. They should provide a copy to their instructor(s) and attempt to schedule a meeting to discuss the implementation of accommodations as early in the semester as possible.

Attendance and consequences of poor attendance:

The instructional programs at VCU are based upon a series of class meetings involving lectures, discussions, field experiences, special readings and reporting assignments. Therefore it is important for each student to be in attendance on a regular basis. A student who misses a class session is responsible for completing all material covered or assignments made during the absence.

- Students having attendance problems should contact their instructor to explain the reasons for nonattendance and to discuss the feasibility of continuing in the course. If the student has fallen so far behind that the successful completion of the course is impossible, the student should withdraw from the course before the end of the first 10 weeks of classes (by Oct. 28, 2022).
- If the student continues to miss class and does not officially withdraw from the course, the instructor may withdraw the student for nonattendance with a mark of "W" before the end of the first 10 weeks of classes or may assign an academic grade at the end. Withdrawals are not permitted after the end of the first 10 weeks of classes. For classes that do not conform to the semester calendar, the final withdrawal date occurs when half of the course has been completed.

Managing stress: Students may experience situations or challenges that can interfere with learning and interpersonal functioning including stress, anxiety, depression, alcohol and/or other drug use, concern for a friend or family member, loss, sleep difficulties, feeling hopeless or relationship problems. There are numerous campus resources available to students including University Counseling Services (804-828-6200 MPC Campus, 804-828-3964 MCV Campus) which provides brief therapy treatment, University Student Health Services (MPC 804 828-8828, MCV Campus 804 828-9220) and the Department of Recreation & Well-Being (RecWell) (804-828-9355). 24 hour emergency mental health support is available by calling (804) 828-6200 or utilizing the National Suicide Prevention Lifeline (dial 988).