

Syllabus CMSC 752/MATH 858R, Spring 2026
Ramsey Theory and its “Applications”

Note: Even though Math 858R is listed under *Selected Topics in Analysis* this is *not* a course in Analysis. It is a course in combinatorics.

This document has three parts with three very different functions.

1. **CONTENT:** What is the content of the course.
2. **POLICY:** How the course is run (office hours, tests, HW, etc).
3. **GENERAL INFO:** This information is helpful for any course you take at UMCP.

CONTENT

Overview: Ramsey Theory is a branch of combinatorics having to do with colorings and patterns. Here are two sample theorems:

1. For all 2-colorings of the edges of the complete graph on 6 nodes, there are 3 nodes so that all the edges between them are the same color.
2. For all 2-colorings of $\mathbb{N} \times \mathbb{N}$ (the infinite grid) there exists four points that form a square that have the same color.

In this course we state and prove many such theorems and also “apply” them— to other parts of math and to Theoretical Computer Science.

1. **The infinite Ramsey Theorem, Hypergraph Ramsey Theorem, Canonical Ramsey Theorem, Large Ramsey Theorem**

”Applications”: The Bolzano Weierstrass Theorem, Proving Programs correct, Well-quasi ordering, Geometry. Logic.

2. **The finite Ramsey Theorems** Upper and lower bounds on the Ramsey Numbers, Ramsey Multiplicity.

”Applications”: Geometry, Logic, History.

3. **Van Der Waerden’s Theorem** Multidim VDW theorem, upper and lower bounds on VDW numbers, poly VDW theorem. Rado’s theorem, Grid Coloring.

”Applications”: Number Theory, Multiparty Comm Complexity, Diag-queens problem.

4. **Optional Topics** Euclidean Ramsey Theory, Ramsey over the reals, Ramsey with other graphs,

REQUIRED TEXT There is no text. There will be notes on line and slides on line.

PREREQUISITES Any Ugrad CMSC 45X course or any Math 4XX course or permission of instructor. Ugrads who want to take the course must get permission of instructor.

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POLICY

1 Basic Information

Course title and Number CMSC 752/Math 858R: Ramsey Theory and its “Applications”

Term: Spring 2026

Credits: 3

Course Dates Jan 27-May 7 except spring break which is March 16-20.

Class Time and Place Tu-Th 12:30-1:45. Room CSI 1121. (NOTE- this is NOT in the IRB building, though the CSI building is right next door.)

Course Website <http://www.cs.umd.edu/~gasarch/COURSES/752/S26/index.html> This is where HW and slides and notes will be.

ELMS Elms will have the recordings of the lectures. Only students from this class will have access to it.

Gradescope You will submit HW on gradescope and this is where you can see your grades and make re-grade requests.

2 Staff

Instructor William Gasarch gasarch@umd.edu, (301) 503-3157.

Office Hours Tu-Th 11:00-12:00, 2:00-3:00 in IRB 2242.

Also by appointment, which can even be at night on zoom: <https://umd.zoom.us/my/gasarch>

TA Javier Marinkovic. marinkov@umd.edu, FILL IN

Office hours: FILL IN study area IRB FILL IN .

Also by appointment, which can even be at night on zoom: FILL IN.

Communication from you to the instructor or TAs You should feel free to

1. email us,
2. post question on piazza, and
3. meet us in office hours or by appt.

Communication from us to you We will email you

1. when HWs are posted,
2. when HW solutions are posted, and
3. other things you need to know.

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3 Homework, Exams, In-class Work, Grading

For all of the below see the Academic Integrity section above for guidance on how much help you can get on the Homework, Exams, and Optional Project.

1. **Homework** There will be problems based on the material. They will be roughly once a week. The Homework will be posted on the course website (NOT on elms) in three forms. We do an example with hw00.

hw00.pdf

hw00.txt- this is plaintext

hw00.tex- this is LaTeX

You may use the .txt or .tex to help you typeset your homework.

After the Dead-Cat day has passed (see later for what that means) I will post hw00sol.pdf- Solutions to some of the problems.

Typed Homework must be typed and submitted on gradescope. If diagrams are needed to be drawn they can be handwritten.

Dead Cat Policy HW is posted on Tues and due the following Tues at 12:30PM. But *everyone* gets an extension to Thursday at 12:30PM. *Do not think the real deadline is Thursday.* I have already given you an extension to Thursday, hence I am not going to give you another one. I use the phrase **Morally due Tuesday Feb 10, 12:30** to mean you can hand it in either then or, without penalty, on Feb 12, 12:30. **DO NOT ABUSE THE PRIVILEGE.**

2. **In Class Midterm** March 31, 2026.
3. **Final** The final will be take home. DUE May 12. NO DEAD CAT. It will be posted May 8 or earlier so you will have plenty of time to work on it and hence no DEAD CAT is needed.

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4 Grading Structure

We will make each HW worth 2% of the grade. We intend to have around 12 HW. That leads to the following table; however, if we have a different number of HW this will change slightly. There will be times in class where I say **EVERYONE GET INTO GROUPS TO WORK ON A PROBLEM**. I intend to do this 10 times but it may vary. Each time you participate that's 2% of your grade. You will not know ahead of time when I will do this, since I will not know ahead of time. Hence you should come to class.

Homework	24%
Midterm	36%
Final	20%
In-class	20%

Grades will be **ROUGHLY**

- 85-100 is an A
- 70-84 is a B
- 50-69 is a C

(I can't imagine anyone getting ≤ 50). Notice that (1) this is **ROUGH**- there may be some adjustments in any direction, and (2) this will be further refined with + and - after the final.

Extra Credit I will assign extra credit problems. These **DO NOT** count towards the grade. They **DO** count towards a letter I may write for you at some later point.

Academic Integrity

Homework You may talk to your fellow students and use AI tools; however, you must hand in your own work and **UNDERSTAND IT**. If you use an AI tool then you must let us know which one you used. **ADVICE**: if you get help from either a human or computer source **CHECK YOUR WORK**. **WARNING**: ChatGPT and other AI's do not do that well in this course (yet).

Exams These must be solely your own work. There will be a take home final that you will be on your honor to do yourself.

5 Course Evaluations

COURSE EVALUATIONS In May you will be asked to fill out course evals. I will urge you to fill out, not just the eval for me, but the eval for **ALL** of your courses. I have been on the committees that reads these evals and it is important that they be filled out.

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GENERAL INFORMATION

UNIVERSITY POLICY We follow university policies. See

<https://www.ugst.umd.edu/courserelatedpolicies.html>

(Note that this is the policy for Undergrad Courses. There is no website for graduate courses, so we will use these policies.)

1 UMD Policies and Resources for Undergraduate Courses

It is our shared responsibility to know and abide by the UMD policies that relate to all courses, which include topic like

- Academic Integrity
- Student and Instructor Conduct
- Accessibility and Accommodations
- Attendance and Excused Absences
- Grades and Appeals
- Copyright and Intellectual Property.

Please visit

<https://www.ugst.umd.edu/courserelatedpolicies.html>

for the UMCP policy on these issues.

2 Resources and Accommodations

2.1 Accessibility and Disability Services

The University of Maryland is committed to creating and maintaining a welcoming and inclusive educational, working, and living environment for people of all abilities. The University of Maryland is also committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of the University, or be subjected to discrimination. The Accessibility & Disability Service (ADS) (see here:)

<https://www.counseling.umd.edu/ads/>

provides reasonable accommodations to qualified individuals to provide equal access to services, programs and activities. ADS cannot assist retroactively, so it is generally best to request accommodations several weeks before the semester begins or as soon as a disability becomes known. Any student who needs accommodations should contact me as soon as possible so that I have sufficient time to make arrangements. For assistance in obtaining an accommodation, contact Accessibility and Disability Service at 301-314-7682, or email them at adsfront-desk@umd.edu. Information about sharing your accommodations with instructors, note taking assistance and more is available from the Counseling Center.

2.2 Student Resources and Services

If you are not doing well in the course and want to do better feel free to talk to me so we can see what we can do. There are also campus services that might be helpful:

Tutoring and Academic Success <https://tutoring.umd.edu/>

UMD Writing Center <https://english.umd.edu/writing-programs/writing-center>

Website of Heath Services <https://sph.umd.edu/academics/advising-resources/undergraduate-center/casa-student-resources-and-information>

2.3 Basic Needs Security

If you have difficulty affording groceries or accessing sufficient food to eat every day or lack a safe and stable place to live, please visit

UMD Division of Student Affairs website <https://studentaffairs.umd.edu/basic-needs-security>
for information about resources the campus offers you.