Math 566   Ramsey Theory   Spring 2017

Instructor	Amites Sarkar
Text	Ramsey Theory (2nd edition, paperback) Graham, Rothschild and Spencer

Syllabus

Graphs and hypergraphs

Ramsey's theorem (finite and infinite versions); compactness principle; monotone subsequence theorem; Erdős–Szekeres upper bound for $R(k)$; probabilistic lower bound for $R(k)$; applications

Progressions and cubes

Van der Waerden's theorem; the Hales–Jewett theorem; Gallai's theorem; Shelah's proof of the Hales–Jewett theorem; recent developments (without proof)

Partition regularity

Schur's theorem; the columns condition and Rado's theorem; Folkman's theorem; Hindman's theorem; recent developments (without proof)

Projects

- Graph Ramsey theory

- Glazer's proof of Hindman's theorem

- Szemerédi's proof of Roth's theorem on arithmetic progressions

- Suk's theorem on the Erdős–Szekeres convex polygon problem

Notes

Ramsey theory grew out of the work of Ramsey, Schur, van der Waerden, Erdős and Szekeres between 1916 and 1935. From the beginning, it had applications to logic, number theory and geometry, and these connections have only strengthened over time. My main aim is to cover the classical theorems listed above, and my second aim is to describe some of the astonishing recent progress in the field.

Course objectives

The successful student will know the statements, proofs and context of the above theorems, and be able to apply these theorems to solve related problems.

<div align="center">**Relation to overall program goals**</div>

Among other things, this course will (i) enhance your problem-solving skills; (ii) help you recognize that a problem can have different useful representations (graphical, numerical, or symbolic).

<div align="center">**Exams**</div>

Midterm   Thursday 27 April
Final   Monday 5 June 1–3 pm. This will be a closed book exam.

<div align="center">**Grading**</div>

I will base the grade on the **midterm** (worth 25%), **presentations** (worth 25%; you'll have to do 50 minute presentations (in pairs) at the end of the quarter), and the **final** (worth 50%). I'll talk more about the presentations in class.

<div align="center">**Office hours**</div>

My office hours are 4–4:50 on Mondays, Tuesdays, Thursdays and Fridays, in 216 Bond Hall. My phone number is 650 7569 and my e-mail is amites.sarkar@wwu.edu