

Seminar Series (Fall 2020 – Spring 2022)

AY 2021-22 Seminars

Date and Time: Friday, March 25, 2022 at 9 AM

Speaker: Carmen Caprau

Location: [Zoom](#)

Abstract: In this presentation, we introduce the concept of colored links and construct a rational function that is an invariant for colored links. Our construction makes use of colored planar graphs with vertices of degree four. We prove that the corresponding link invariant yields certain graphical relations for 4-valent planar graphs; these graphical relations provide an efficient way for computing the invariant of a given colored link. We also explain how our construction allows for extending the invariant to another type of links, called colored singular links. This is joint work with undergraduate students Audrey Baumheckel and Conor Righetti.

Date and Time: Friday, October 22, 2021, at 9 AM

Speaker: Marat Markin

Location: [Zoom](#)

Title: *On the Chaoticity of Derivatives*

Abstract: We introduce sufficient conditions for linear chaos and thereby show that the n th derivative with maximal domain is a chaotic operator in the spaces $C[a, b]$ and $L_p(a, b)$ ($-\infty < a < b < \infty$) for each $n \in \mathbb{N}$.

The new results are to be presented for the first time.

Date and Time: Friday, October 7, 2021, at 9 AM

Speaker: Tamás Forgács

Location: Zoom

Title: *Very triangular number – an exploration*

Abstract: Very triangular numbers are an example of a subset of the natural numbers with the property that (i) they are defined by a polynomial $f: \mathbb{N} \rightarrow \mathbb{N}$, and that (ii) the sum of their binary digits also belongs to $f(\mathbb{N})$. In this talk we prove a number of results concerning very triangular numbers and their distribution among the triangular numbers. We show that their (natural) density within the set of triangular numbers is zero, and discuss some open questions regarding the existence and length of arithmetic progressions of very triangular numbers among the triangular numbers

SPRING 2021 Seminars

Date and Time: Friday, April 16, at 8:50 AM

Location: [Zoom link](#)

Speaker: Marat Markin

Title: *On Spectral Mapping Theorems and Asymptotics of Scalar Type Spectral C_0 -Semigroups*

Abstract: We establish spectral inclusion and mapping theorems for scalar type spectral operators and thereby extend a *weak spectral mapping theorem* and a *generalized Lyapunov stability theorem*, known to hold for the C_0 -semigroups of normal operators on complex Hilbert spaces, to the more general case of the C_0 -semigroups of scalar type spectral operators on complex Banach spaces. For such semigroups, we also obtain a spectral mapping theorem for point and continuous spectrum and exponential estimates with the best stability constants. Further, we extend to a Banach space setting the *Gearhart-Prüss-Greiner characterization* of uniform exponential stability for C_0 -semigroups on complex Hilbert spaces and acquire as an instant corollary a characterization of uniform exponential stability for scalar type spectral and eventually norm-continuous C_0 -semigroups.

FALL 2020 Seminars

Date and Time: Friday, October 30, at 9 AM

Location: [Zoom link](#)

Speaker: Marat Markin

Title: *On Weak Spectral Mapping Theorems, Spectral Structure and Asymptotics of C_0 -Semigroups Generated by Scalar Type Spectral Operators*

Abstract: We establish a *weak spectral mapping theorem* for scalar type spectral operators and apply it to extend a *weak spectral mapping theorem* and the *generalized Lyapunov stability theorem*, known to hold for the C_0 -semigroups of normal operators on complex Hilbert spaces, to the more general case of C_0 -semigroups of scalar type spectral operators on complex Banach spaces. For such semigroups, we also reveal finer spectral structure, obtain exponential estimates, and establish an analogue of the *Gearhart-Prüss-Greiner characterization* of the uniform exponential stability for C_0 -semigroups on complex Hilbert spaces.

Date and Time: Friday, October 23, at 9 AM

Location: [Zoom](#)

Title: *Automorphism Groups of Spatial Graphs and Hyperplane Arrangements over Finite Fields*

Speaker: Oscar Vega

Abstract: This presentation will be two talks merged into one, hence the long title. The results that will be presented have been obtained by two of the presenter's graduate students (their thesis work).

First part (the one with the graphs). Given a graph, G , we embed it in $\mathbb{R}^3$ and study what automorphisms of G are representable by homeomorphisms of $\mathbb{R}^3$.

There have been many recent developments on this subject, given its connection to intrinsically knotted/linked graphs discovered by Conway and Gordon (1983) and, independently, by Sachs (1983-84). These, more recent, efforts have been mainly focused on the families of graphs obtained by doing $\Delta - Y$ moves on either the Petersen graph or the Heawood graph; they are nicely summarized in a survey by Flapan, Mattman, Mellor, Naimi, and Nikkuni that was published in 2017.

Most of the new results presented in this talk will be about C_{13} , which is obtained by doing one $\Delta - Y$ move on the Heawood graph.

Second part (the one with the arrangements). Hyperplane arrangements are ubiquitous in combinatorics; they are connected to lattice theory, matroids, reduced words, etc. Usually, hyperplane arrangements are studied in vector spaces over $\mathbb{R}$ or $\mathbb{C}$, thus not much is known about hyperplane arrangements in vector spaces over finite fields. In fact, many concepts that are important in the standard theory become irrelevant in a finite world (e.g. number of regions enclosed by the hyperplanes). In spite of this, there is a surprisingly rich structure that is obtained when looking at the 'classical' hyperplane arrangements.

This presentation will summarize known and new results on the braid and Shi arrangements of vector spaces over fields of non-zero characteristic that generalize the work of Settepanella (2013).

Date and Time: Friday, September 25, at 9 AM

Location: [Zoom](#)

Title: *Zero distribution of a Sheffer sequence*

Speaker: Khang Tran

Abstract:

In the past, Forgacs and I studied the zero distribution of various sequences of polynomials generated by finite recurrences or equivalently by rational generating functions. In this project, we make an initial transition of our research to understand the zeros of polynomials generated by transcendental generating functions. In particular we study the zeros of the sequence $\{H_m(s)\}_{m=0}^{\infty}$ generated by

$$\sum_{m=0}^{\infty} H_m(s) \frac{z^m}{m!} = Q(z)^s Q(-z)^{1-s}$$

where $Q(z) = (z_1 - z)(z_2 - z)$, $z_2 > z_1 > 0$. This sequence is a special case of a class of Sheffer polynomials whose combinatorial properties are developed by Kim and Cheon. In this talk, we focus on the analytic aspect of this sequence by proving that for all large m , besides the two trivial zeros at $s = 0, 1$, the zeros of $H_m(s)$ lie on the critical line $\Re s = 1/2$.

Date and Time: Friday, September 11, at 9 AM

Location: [Zoom](#)

Title: *Studying Heuristics and Problem Solving: Highlights of my work during My Difference in Pay Leave*

Speaker: Agnes Tuska

Abstract: As I planned in my Difference in Pay Leave application for the 2019-2020 academic year, I helped Dr. Andrew Benedek to organize and run the 2nd International Conference on Heuristics: Motivating, Orienting and Modeling Invention in Balatonfüred, Hungary, August 30-September 1, 2019. The program of the conference is available at the website <https://heurisztika.btk.mta.hu/en/program>

As a continuation of our work, I proposed and led the organization of a special session on How to Solve It? Heuristics and Inquiry Based Learning with co-organizers Mario Banuelos and Andrew Benedek for the American Mathematical Society's Spring Western Sectional Meeting,

California State University, Fresno, May 2-3, 2020

(see https://www.ams.org//meetings/sectional/2272_program_ss18.html#title).

I was a scheduled presenter there. The conference was cancelled due to the pandemic. However, I decided to give the presentation I planned for the AMS meeting on George Polya's influence on mathematics competitions in the USA at the History of Mathematics & Teaching of Mathematics International Conference (see <https://www.unimiskolc.hu/hmtm/>), in which I was a member of the Organizing and Scientific Committee. During April, we re-organized the conference into a virtual conference, still hosted by the University of Miskolc, May 20-24, 2020. Later, as invited speaker, I also presented an extended version of this talk at the online Summer University/Intensive Course on "Central European Contributions to the History of Mathematics and Teaching Mathematics", organized by the CEEPUS Network, coordinated by the University of Miskolc, July 6-17, 2020. Now I want to share some of my findings with you in the Fresno State community, too!

