SEAM 2017

ABSTRACTS

Acharya, Keshav, Embry-Riddle Aeronautical University
Title: *Titchmarsh-Weyl theory for vector valued Schrödinger operators*

The main purpose of this talk is to present the basic theory of Weyl m function for vector valued Schrödinger operators. More specifically, we will introduce the m function in terms of resolvent operators and show that it maps complex upper half plane to Siegel half space. We then discuss about the Weyl disc and Weyl circle. This is an extension of Weyl theory of Schrödinger operators from one dimensional space.

Acharyya, Soumyadip, Embry - Riddle Aeronautical University Worldwide
Title: *Difference of Two Weighted Composition Operators on Bergman Spaces*

Let φ be a holomorphic self-map of the open unit disk $\mathbb{D}$ and u be a measurable map on $\mathbb{D}$. The weighted composition operator uC_φ with weight u and symbol φ is defined on $H(\mathbb{D})$ by

$$\left(uC_\varphi\right)(f)(z) = u(z)\left(f \circ \varphi\right)(z), \quad f \in H(\mathbb{D}), z \in \mathbb{D}.$$

Following the techniques developed by Moorhouse [1] and Saukko [2], we characterize the compactness of the difference of two weighted composition operators acting between different weighted Bergman spaces, under certain restrictions on the weights. Our result generalizes a result of Moorhouse [1] about the difference of two unweighted composition operators. We also calculate (up to equivalence) the Hilbert-Schmidt norm of a difference of two weighted composition operators acting from Bergman or Hardy space to an $L^2(\mu)$ space. This is joint work with Zhijian Wu.

[1] J. Moorhouse, Compact differences of composition operators, *J. Funct. Anal.* 219 (2005) 70-92.

[2] E. Saukko, Difference of composition operators between standard weighted Bergman spaces, *J. Math. Anal.Appl.* 381 (2011) 789-798.

Aleman, Alexandru, Lund University
Title: **Harmonic maps and shift-invariant subspaces**

Harmonic maps between Riemannian manifolds are defined as critical points of the energy functionals, or alternatively by means of a differential equation. Their study is a vast area of research in differential geometry and global analysis. In this talk I will present briefly a method originating from the theory of integrable systems which associates to a harmonic map a family of shift-invariant subspaces of $L^2(\mathbb{T}, \mathbb{C}^n)$. The main purpose is to relate the properties of these invariant subspaces to those of the original map, and I plan to describe some situations when this point of view leads to an interesting interplay between differential geometry and operator theory. This is a report about joint work, mainly with R. Pacheco and J.C. Wood.

Augat, Meric, University of Florida
Title: *Free Polynomial Biholomorphisms*

We examine free polynomials acting on a free domain and their application to Linear Matrix Inequalities. We obtain a result about the underlying algebraic structure of a class of free rational mappings and use this to investigate their invertibility.

Baratchart, Laurent, INRIA Sophia-Antipolis
Title: *Hardy-Hodge decomposition on compact manifolds*

We show that on a smooth compact hypersurface M embedded in R_n, every R_n valued vector field of L_p class, $1 < p < \infty$, decomposes as the sum of two (nontangential limits on M of)harmonic gradient of Hardy class H_p (one from inside, one from outside) and of a tangent divergence free vector field of L_p class. The results carries over to Lipschitz-smooth M for restricted range of p. We discuss implications for inverse potential problems.

Beneteau, Catherine, University of South Florida
Title: *Optimal Polynomial Approximants*

In this talk, I will discuss recent results concerning polynomials that are best approximants of the inverses of functions in certain Hilbert spaces of analytic functions.

Carlsson, Marcus, Lund University
Title: *General domain Hankel and Toeplitz integral operators.*

I will introduce a broad extension of the concept of Hankel and Toeplitz operators acting on L^2-spaces whose domain are subsets of $\mathbb{R}^n$, a particular case being the so called small Hankel operators in $\mathbb{R}^n$. I present several results mainly concerning their structure when having finite rank and/or being positive semidefinite, which generalize classical theorems of Kronecker, Fischer and Caratheodory-Fejer. Beyond these not much is known in this generality, and I hope to inspire other researchers to further study these operators. Applications to multidimensional frequency estimation will be discussed, motivating the need for an understanding of these operators on "general domains", as opposed to simple geometrical domains such as $\mathbb{R}^n_+$ which figures in the definition of small Hankel operators.

Chu, Cheng, Vanderbilt University
Title: *Composition operators on the bidisk*

We study the boundedness of composition operators on the bidisk using reproducing kernels. We show that a composition operator is bounded on the Hardy space $H^2(\mathbb{D}^2)$ or the Bergman space $L^2_a(\mathbb{D}^2)$ if some associated function is a positive kernel. This positivity condition naturally leads to the study of sub-Hardy Hilbert spaces of the bidisk, which are analogs of de Branges-Rovnyak spaces on the unit disk. We discuss multipliers of those spaces and obtain some classes of bounded composition operators on the bidisk.

Cima, Joseph, University of North Carolina, Chapel Hill
Title: *On one component inner functions.*

We give examples of one component inner functions and some inner functions which are not one component.

Clouatre, Raphael, University of Manitoba
Purity of absolutely continuous constrained commuting row contractions

A Hilbert space contraction T is said to be *constrained* (or *of class* C_0) if it is absolutely continuous and the associated Sz.-Nagy–Foias H^∞-functional calculus has non-trivial kernel. The structure of such contractions is rather well-understood due to work of Sz.-Nagy, Foias,

Bercovici and others, who developed flexible functional models. It is known that a constrained contraction must be pure: its minimal isometric coextension does not have a unitary summand. This is a basic ingredient of the aforementioned structure theory, and the purpose of this talk is to discuss a multivariate generalization of this fact. We show that it holds for a constrained absolutely continuous commuting row contraction T, provided that the ideal of functions which annihilate T has a sufficiently small zero set on the sphere. We also discuss some examples that illustrate the difficulties inherent to the higher dimensional setting. This is based on joint work with Ken Davidson.

Davidson, Kenneth, University of Waterloo
Title: *Choquet order and hyperrigidity for function systems*

The Choquet order on measures is used to establish that states on a function system always have a representing measure supported on the set of extreme points of the state space (in a technical sense). We introduce a new operator-theoretic order on measures, and prove that it is equivalent to the Choquet order. This leads to some improvements in the classical theory, but more importantly it leads to some new operator-theoretic consequences. In particular, we establish Arveson's hyperrigidity conjecture for function systems. This yields a significant strengthening of the classical approximation theorems of Korovkin and Šaškin. This is joint work with Matthew Kennedy.

Deterding, Stephen, University of Kentucky
Title: *Bounded point derivations on $R^p(X)$ and approximate derivatives*

Let X be a compact subset of the complex plane and let $R_0(X)$ denote the set of all rational functions whose poles lie off X. The function space $R(X)$ is the uniform closure of $R_0(X)$. The space $R^p(X)$ is an important function space that is closely related to $R(X)$. For $1 \leq p < \infty$, $R^p(X)$ is the closure of $R_0(X)$ in the L^p norm. A bounded point derivation on $R(X)$ at a point x_0 is a bounded linear functional D on $R(X)$ such that $D(fg) = D(f)g(x_0) + D(g)f(x_0)$ for all functions f, g belonging to $R(X)$. It is known if there is a bounded point derivation on $R(X)$ at x_0, then every function in $R(X)$ has an approximate derivative at x_0. An approximate derivative is defined in the same way as the usual derivative except that instead of taking the limit in the difference quotient over all of X, the limit is taken over a subset of X with full

area density at x_0. One can also define bounded point derivations for $R^p(X)$, although a slightly different definition must be made. In this talk we will introduce bounded point derivations on $R^p(X)$ and discuss when the existence of a bounded point derivation on $R^p(X)$ implies that every function in $R^p(X)$ has an approximate derivative at x_0.

Discenza, Chris, University of Florida
Title: *Wave interactions over circular depth contours*

We consider an interesting problem of shallow water waves trapped over a depth with circular symmetric contours. The Hamiltonian formulation of Zakharov yields a quadratic term corresponding to a linear non-self-adjoint complex eigenvalue problem and a cubic term that describes three wave interaction. We investigate the invariants and dynamics of some resonant triad clusters for this system.

Feldman, Nathan, Washington & Lee University
Title: *Convex-Cyclicity & Convex-Polynomial Approximation*

A bounded linear operator on a Banach space X is convex-cyclic if it has an orbit whose convex-hull is dense in the space X. We will discuss convex-cyclic operators, invariant convex sets, and convex-polynomial approximation in various function spaces.

Ferguson, Tim, University of Alabama
Title: *Norm of the Backward Shift and Related Operators in Hardy and Bergman Spaces*

We study bounds for the backward shift operator $f \mapsto (f(z)-f(0))/z$ and the related operator $f \mapsto f - f(0)$ on Hardy and Bergman spaces of analytic and harmonic functions. If u is a real valued harmonic function, we also find a sharp bound on $M_1(r, u - u(0))$ in terms of $|u|_{h^1}$, where M_1 is the integral mean with $p = 1$.

Fleeman, Matthew, Baylor Univeristy
Title: *Preliminary findings on hyponormal operators on the Bergman space with non-harmonic symbol*

The Toeplitz operator acting on the Bergman space $A^2(\mathbb{D})$, with symbol φ is given by $T_\varphi f = P(\varphi f)$, where P is the projection from $L^2(\mathbb{D})$ onto the Bergman space. In this talk we will present some history

on the study of hyponormal Toeplitz operators acting on $A^2(\mathbb{D})$, as well as give some results for when φ is a non-harmonic polynomial.

Hamm, Keaton, Vanderbilt University
Title: *Regular Families of Kernels for Nonlinear Approximation*

We study sufficient conditions on families of approximating kernels which provide N-term approximation errors from an associated nonlinear approximation space that match the best known orders of N-term wavelet expansion. These conditions provide a framework which encompasses some notable approximation kernels including splines, so-called cardinal functions, and many radial basis functions such as the Gaussians and general multiquadrics. We will discuss examples of such kernels to justify the criteria, and some computational experiments that demonstrate the theoretical results. Additionally, the techniques involved allow for some new results on N-term interpolation of Sobolev functions via radial basis functions.

Hartz, Michael, Washington University in St. Louis
Title: *Quotients of multipliers in complete Pick spaces*

Every function in the Hardy space on the unit disc is a quotient of two functions in H^∞. I will talk about a generalization of this result, which says that every function in a complete Pick space is a quotient of two multipliers. This applies in particular to the Dirichlet space. Moreover, I will mention an application regarding the Corona problem for multiplier algebras. This is joint work with Alexandru Aleman, John McCarthy and Stefan Richter.

Hocutt, Jeramiah, University of Florida
Title: *'Twisted Duality' for the Clifford von Neumann Algebra.*

We consider the von Neumann algebra $A[V]$ that envelops the Clifford algebra $C(V)$ over a real inner product space V in its tracial left regular representation, showing that if Z is a real subspace of V then the von Neumann subalgebra generated by $Z^\perp$ coincides with the graded commutant of the von Neumann subalgebra generated by Z.

Jamieson, Jessie University of Nebraska - Lincoln
Title: *Revisiting the Wellposedness of the von Karman Beam Model*

In this talk, we take a tour of the seminal result by John Lagnese on the wellposedness of a nonlinear elasticity model that represents a beam analogue of the von Karman plate. Interest in nonlinear beams has been recently reinvigorated by the study of aeroelastic flutter, as lower-dimensional simulations of beams in 2D flow provide many insights into the phenomenon. To facilitate further analytic and numerical study of the von Karman beam, we revisit Lagnese's proof and provide a more streamlined version thereof using the framework of locally Lipschitz perturbations of m-accretive operators.

Khavinson, Dmitry, University of South Florida
Title: *Dirichlet's problem on an ellipsoidal cylinder*

We show that the Poisson integral solution of the Dirichlet problem with entire data of minimal type posed on an ellipsoidal cylinder is an entire harmonic function. This is joint work with E. Lundberg and H. Render.

Kizgut, Ersin, Çankaya University
Title: *On bounded and unbounded operators*

A continuous linear operator $T : E \to F$ is called bounded if there exists a neighborhood U of origin of E such that the image $T(U)$ is a bounded set in F. We denote $(E, F) \in \mathfrak{B}$ iff any operator $T : E \to F$ is bounded. In this talk we discuss some consequences of existence of a factorized unbounded operator $T : E \to F$ under certain conditions, and occurrence of the relation $(E, F) \in \mathfrak{B}$ in connection with the isomorphisms of Cartesian products. We also concentrate on some stability results for the projective tensor products, concerning the problem of topologies posed by A. Grothendieck.

Kubiak, Damian, Tennessee Technological University
Title: *Banach envelopes of some quasi-Banach function spaces.*

We study Banach envelopes of certain Cesaro-type function spaces (spaces generated by certain positive sublinear operators). We find conditions under which the Banach envelope is a weighted L_1-space isometrically as well as isomorphically.

Kwon, Hyun, The University of Alabama
Title: *The trace of the curvature determines similarity.*

We prove that the quantity that appears in a recent similarity characterization for Cowen-Douglas operators is the trace of the curvature of the eigenvector bundle. This gives the first geometric interpretation of the similarity of operators. The talk is based on joint work with Yingli Hou and Kui Ji.

Le, Trieu, The University of Toledo
Title: *Algebraic properties of m-isometric commuting tuples*

The notion of m-isometric operators was introduced and investigated by Agler in the eighties. Generalizing to the multivariate situation, Gleason and Richter defined and studied m-isometric commuting tuples around ten years ago. I will talk about various algebraic properties of such tuples: nilpotent perturbations, products, and Möbius transformations. The motivation of this work comes from the corresponding results for m-isometric operators recently investigated by several researchers.

Li, Haodong, Clemson University
Title: *Toeplitz Operators on Framed Hilbert Spaces*

Very often the operators that we study appear most naturally in highly non-diagonal representation. The main goal of spectral theory is to solve this problem by exhibiting for many operators a natural orthonormal basis with respect to which the operators have diagonal representations. However, this can be done only for certain classes of operators. In this talk, we will present a class of operators for which we can determine all of their basic operator-theoretic properties from their original representation which is not diagonal in the classical sense. There are many important subclasses of operators which belong in our class, including Toeplitz operators on various function spaces, some pseudo-differential operators, some singular integral operators, etc.

Li, Dongxing, SUNY Brockport
Title: *D_K spaces and Carleson measures*

We characterize Carleson measures for the weighted Dirichlet spaces D_K with a general weight function $K(t)$ by using Hadamard products. We also give some sufficient geometric conditions for Carleson measures for D_K.

Lundberg, Erik, Florida Atlantic University
Title: *The arc length of a random lemniscate*

Erdös, Herzog, and Piranian posed the extremal problem of determining the maximum length of a polynomial lemniscate $\{z \in \mathbb{C} : |p(z)| = 1\}$ when p is a monic polynomial of degree n. In this talk, we study the length and topology of a random lemniscate whose defining polynomial has independent Gaussian coefficients. In the special case of the Kac ensemble we show that the length approaches a nonzero constant as $n \to \infty$. We also show that the average number of connected components is asymptotically n, and we observe a positive probability (independent of n) of a giant component occurring.

Luo, Shuaibing, Hunan University
Title: *Reducing subspaces of the Dirichlet space*

Suppose T is a bounded linear operator on a Hilbert space $\mathcal{H}$, if a closed subspace $\mathcal{M}$ of $\mathcal{H}$ is invariant under both T and T^*, then $\mathcal{M}$ is called a reducing subspace of T on $\mathcal{H}$. Reducing subspaces of M_B on the Hardy and Bergman spaces have been studied extensively in the past, where B is a finite Blaschke product. But little is known about the reducing subspaces of M_B on the Dirichlet space. In this talk, we will use local inverses and Riemann surfaces to discuss the structure of the reducing subspaces of M_B on the Dirichlet space.

Lupu, Cezar, University of Pittsburgh
Title: *Analytic aspects in the evaluation of some multiple zeta values*

In this talk, we shall discuss some new results in the evaluation of some multiple zeta values (MZV). More precisely, we provide evaluation of the Hoffman basis in terms of an infinite rational series involving even values of the Riemann zeta function. We also discuss similar results for the multiple t-values and alternating multiple zeta values. The multiple zeta values (Euler-Zagier sums) were introduced independently by Hoffman and Zagier in 1992 and they play a crucial role at the interface of analysis, number theory, combinatorics, algebra and physics.

Malman, Bartosz, Lund University
Title: *Continuous functions in de Branges-Rovnyak spaces*

The de Branges-Rovnyak spaces $\mathcal{H}(b)$, where b is in the unit ball of H^∞, are Hilbert spaces of analytic functions contractively contained in the Hardy space H^2. The theory often splits into branches, depending on whether the quantity $\log(1-|b|)$ is Lebesgue-integrable on the circle or not. In the former case, it is know that the intersection $\mathcal{A} \cap \mathcal{H}(b)$ is dense in the space, where $\mathcal{A}$ is the disc algebra. We confirm that this is also the case of non-integrability of $\log(1-|b|)$, answering a question of Emmanuel Fricain.

Catherine Bénéteau, Alberto A. Condori, Constanze Liaw, William T. Ross, Alan A. Sola. Some open problems in complex and harmonic analysis, Report on problem session held during the conference Completeness problems, Carleson measures, and spaces of analytic functions *Contemporary Mathematics,* 679:218-229, 2015

Marx, Gregory, Virginia Tech
Title: *Noncommutative kernels*

In this talk, we introduce free noncommutative function theory and the relatively new notion of noncommutative kernels. We give characterizations of completely positive noncommutative kernels and globally bounded noncommutative kernels, and we realize some well-known results from operator theory (e.g. Stinesprings dilation theorem and Wittstocks decomposition theorem) as corollaries.

This is joint work with Joseph A. Ball and Victor Vinnikov.

Mitkovski, Mishko, Clemson University
Title: *New approach to Balian-Low-type theorems*

The theorem of Balian and Low on the non-existence of well-localized Gabor-Riesz bases is one of the most important results in time-frequency analysis. We provide a new approach to the Balian-Low-type theorems using continuous frames and group representations. We show how these are connected to some density results.

Nitzan, Shahaf, Georgia Institute of Technology
Title: *Persistence as a spectral property*

A Gaussian stationary sequence is a random function $f : \mathbb{Z} \to \mathbb{R}$, for which any vector $(f(x_1), ..., f(x_n))$ has a centered multi-normal distribution and whose distribution is invariant to shifts. Persistence is the event of such a random function to remain positive on a long interval $[0, N]$. Estimating the probability of this event has important implications in engineering , physics, and probability. However, though active efforts to understand persistence were made in the last 50 years, until recently, only specific examples and very general bounds were obtained. In the last few years, a new point of view simplifies the study of persistence, namely - relating it to the spectral measure of the process.

In this talk we will use this point of view to study the persistence in cases where the spectral measure is 'small' or 'big' near zero.

This talk is based on Joint work with Naomi Feldheim and Ohad Feldheim.

Northington, Michael, Georgia Institute of Technology
Title: *Balian-Low Type Theorems from Fourier Multipliers*

When shift-invariant spaces and Gabor systems are used as approximation spaces, it is advantageous for the generators of such spaces to be localized and for the spaces to be representative of a large class of functions. However, the celebrated Balian-Low Theorem shows that if a Gabor system generated by a function forms a Riesz basis for $L^2(\mathbb{R})$, then the function must be poorly localized in either time or frequency. In this talk, I will discuss several sharp results similar to the Balian-Low Theorem which hold either for Gabor systems or shift-invariant spaces, and which follow from a more general theorem placing constraints on Fourier multipliers.

Perfekt, Karl-Mikael, The University of Tennessee, Knoxville
Title: *The spectrum of the Neumann-Poincare operator on domains with corners and conical points*

The study of the Neumann-Poincaré (NP) operator (or the double-layer potential) of a domain dates back to Poincaré, Carleman, and Radon. The NP operator may be used as a tool to solve the Dirichlet and Neumann problems, but it also served as a prominent example in the emerging abstract spectral theories of Hilbert, Fredholm, and F.

Riesz. Later, the NP operator was central in (quasi)-conformal mapping and in the development of the theory of singular integral operators. Recently, questions from materials science have revived interest in the spectral properties of the NP operator on domains with corners, edges, and conical points.

I aim to give an overview of recent developments, with particular focus on the NP operator's action on the energy space of the domain. In this case, there is a classical similarity equivalence between the NP operator and the Ahlfors-Beurling transform of the domain. In two real dimensions, this invites the use of complex analysis to analyze the spectrum for domains with corners. I will also present very recent work for domains in 3D with conical points featuring rotational symmetry. In this situation we have been able to describe the spectrum both for boundary data in L^2 and for data in the energy space. In the former case, the essential spectrum consists of the union of countably many self-intersecting curves in the plane, and outside of this set the index may be computed as the winding number with respect to the essential spectrum. In the latter case the essential spectrum consists of a real interval.

Based on joint papers with Johan Helsing and Mihai Putinar.

Phan, Tuoc, University of Tennessee, Knoxville
Title: *On two weighted nonlinear Calderon-Zygmund estimates for nonlinear elliptic equations*

We study the regularity estimates of Calderon-Zygmund type for weak solutions of a class of nonlinear elliptic equations. Assuming that the equation is degenerate with some weight function in the Muckenhoupt class A_2, we give a sufficient condition to obtain the higher regularity estimate in another weighted Lebesgue space space for gradients of weak solutions. The result is considered a two weighted Calderon-Zygmund estimate for nonlinear operators. The talk is based on the paper available at

https://arxiv.org/pdf/1702.08622.pdf.

Poltoratski, Alexei, Texas A&M
Title: *Two-spectra theorem with uncertainty*

One of the old problems of Fourier analysis, the so-called Gap Problem, studies properties of measures on the real line whose Fourier transform has a gap in its support. Such measures appear in many applications such as prediction theory, signal processing and electrical engineering. In my talk I will discuss recent progress in the Gap Problem along with new applications. Among such applications I will present an uncertainty version of the classical two-spectra theorem by Borg for Schrödinger operators.

This part of the talk is based on joint work with N. Makarov.

Prajitura, Gabriel, College at Brockport, State University of New York
Title: *Orbital behavior of operators*

We will discuss several classes of operators defined in terms of orbits. For example, operators with all orbits going to 0 or operators with all nonzero orbits going (in norm) to infinity.

Ramachandran, Koushik, Oklahoma State University
Title: *Equidistribution of zeros of random polynomials*

We study the asymptotic distribution of zeros of random polynomials $P_n(z) = \sum_{k=0}^{n} A_k B_k(z)$, where A_k are non-trivial random coefficients and B_k are deterministic polynomials chosen from a standard basis such as Bergman or Szego polynomials. We prove necessary and sufficient conditions on the coefficients for convergence of the zero counting measures and explicitly identify the limiting measure.

This is based on joint work with Igor Pritsker.

Ramirez Flores, Aaron, Clemson University
Title: *Density conditions for generalized frames*

Given generalized frames on a Hilbert space satisfying a certain localization property, we develop very general density results. Several applications of the density results can be obtained under natural geometric conditions on the index sets, particularly on reproducing kernel Hilbert spaces.

Russo, Benjamin, University of Connecticut
Title: *A Generalization of the Fock Space*

In this talk we will introduce a generalized Fock space which uses the Mittag-Leffler function as its reproducing kernel. This space has been featured in the development of a finite difference method. However, it has yet to be investigated as a space of entire functions. We will discuss some preliminary results in comparison to the Fock space and potential applications.

This is joint work with Joel Rosenfeld.

Sargent, Meredith, Washington University in St Louis
Title: *A Boundary Version of Carlson*

In 1913, Bohr observed that Dirichlet series on the positive half plane can be connected to power series on the infinite polydisk. In the modern viewpoint, we use this observation to think of any vertical line in the half plane as an ergodic flow on the polytorus: in fact, Carlson's theorem about integrals in the mean of Dirichlet series can be interpreted in this way. Of particular interest is the imaginary axis because it connects to convergence questions on the boundary of the polydisk. In this talk, we explore integrals in the mean along the imaginary axis and how they connect to norms of power series on the polydisk.

Stevenson, Leonard, Drexel University
Title: *Antiderivatives of Noncommutative Functions*

A noncommutative function (or nc function) of a matrix variable (as developed by Dr. Dmitry Kaliuzhnyi-Verbovetskyi and Dr. Victor Vinnikov) is one that respects the matrix operations of direct sums and similarities. The order of an nc function is determined by the number of matrix variables present. Given an nc function of order one, I will demonstrate the necessary and sufficient conditions for the existence and uniqueness of an antiderivative of order zero.

Stovall, Betsy, University of Wisconsin
Title: *Uniformizing curvature-dependent bounds in harmonic analysis*

We will discuss some operators in harmonic analysis where curvature plays an important role and recent progress and some open problems toward uniformizing bounds for these operators.

Tener, James, UC Santa Barbara
Title: *Singular values of weighted composition operators and second quantization*

I will introduce a family of non-compact weighted composition operators on the Hardy space of the disk which arose in the context of conformally invariant quantum field theory. I will present recent work, joint with Mihai Putinar, in which we show that these operators have essential norm equal to one, and estimate the rate of decay of their singular values. As a byproduct, we obtain estimates on the singular values of restriction operators, and show that the weighted composition operators exhibit an analog of the Fisher-Micchelli phenomenon.

Thomack, Andrew, Florida Atlantic University
Title: *The Number of Zeros of Random Harmonic Polynomials and its Asymptotic Growth*

A complex harmonic polynomial is the sum of a complex polynomial and a conjugated complex polynomial, of degrees n and m respectively, thus violating the conditions of the Fundamental Theorem of Algebra. We will discuss the variation seen in the number of zeros of these polynomials and set up a model for discussing a random harmonic polynomial. Li and Wei (2009) presented a formula for the expected number of zeros of a random harmonic polynomial in $\mathbb{C}$. We will use their formula to inspect the asymptotic growth of the expectation as n increases to infinity.

Wallace, Ryan, University of Arkansas, Fayetteville
Title: *Singular Factors of Functions in Model Spaces Generated by Certain Blaschke Products*

Given a Blaschke product B on the complex unit disc, let K_B be the orthogonal complement in H^2 (the Hardy space) of the closed shift-invariant subspace $BH^2 = \{Bf : f \in H^2\}$. Then what conditions on B guarantee that no function in K_B has a nontrivial singular inner factor? This simple question appears to be quite difficult to answer in general, and only a few results are known in the literature. We give some new results on certain properties of B that are sufficient to rule out singular factors in K_B (with some qualification).

Wijesooriya, Udeni, University of Florida
Title: *Finite Rank Isopairs*

An algebraic isopair is a commuting pair of pure isometries that is annihilated by a polynomial defining a distinguished variety. In 2009, Jim Agler, Greg Knese and John E. McCarthy proved that any two nearly cyclic isopairs that get annihilated by the same minimal polynomial are nearly unitarily equivalent. In this talk, we will discuss a notion of the rank of algebraic isopairs and its relation to nearly multi-cyclicity, and an obstacle we got along the way of generalizing the above result to nearly multi-cyclic isopairs.

Yilmaz, Faruk , University of Tennessee, Knoxville
Title: *Approximation of invariant subspaces by finite codimensional ones*

The Dirichlet-type space $\mathcal{D}_2$ consists of all analytic functions f on the unit disc $\mathbb{D}$ such that f' is in the Hardy Hilbert space $\mathbf{H}^2$. In this talk, we discuss the result that proves that every nonzero invariant subspace of the multiplication operator M_z on the $\mathcal{D}_2$ space can be approximated by finite co-dimensional ones. For the Dirichlet space $\mathbf{D}$ we have a partial analogue.

Zhang, Ziliang, Vanderbilt University
Title: *The first Szego theorem of the Bergman Toeplitz matrix*

In this talk, we focus on the asymptotic behavior of the determinants of Bergman Toeplitz matrices with symbols in $H^\infty(\mathbb{D}) + C(\overline{\mathbb{D}})$. We will establish a criterion of the asymptotic invertibility and an asymptotic inversion formula for Bergman Toeplitz operators. Using the formula we will obtain the first Szegö theorem for Bergman Toeplitz matrices.

Zhao, Ruhan, SUNY Brockport
Title: *Toeplitz Operators and Berezin Type operators*

We discuss boundedness and compactness of a new class of integral operators, called Berezin type operators, from weighted Bergman spaces to weighted Lebesgue spaces. The results are closely related to that of Toeplitz operators between weighted Bergman spaces.