COLLOQUIUM Summer 2010

Phuoc Le Ho

Department of Mathematics

University of Kentucky

Lexington, KY

Tuesday, July 20, EMCS 206, 3:30-4:30 pm.

Upper Bounds on the Splitting of the Eigenvalues

Abstract. We establish the upper bounds for the difference of the first two eigenvalues of $\triangle w + \lambda w = 0$ with relative and absolute boundary conditions. Here $\triangle$ is the Hodge Laplacian acting on $k-$ forms, and relative and absolute boundary conditions are generalization of Dirichlet and Neumann boundary conditions respectively. The domains are taken to be a family of symmetric regions in $\mathbf{R}^n$ consisting of two cavities joined by a straight thin tube. The effect of adding a thin tube of cross-sectional radius ε to the cavity $\mathcal{C}$ is to shift the relative eigenvalues of $\mathcal{C}$ by a vanishing small order of ε. We show that the relative eigenforms decay exponentially along the tube. We then find the matrix representation of the Hodge Laplacian restricted to a suitable 2-dimensional subspace. The upper bounds follow by calculating the eigenvalues of this matrix.

COLLOQUIUM Summer 2010

Tankut Dogrul

Department of Mathematics

Carnegie Mellon University

Pittsburgh, PA

Tuesday, July 27, EMCS 422, 3:30-4:30 pm.

Nash equilibrium in a model with several large investors

Abstract. Abstract: An equilibrium model with a representative market maker and finite number of large traders is considered. Prices for (illiquid) European contingent claims with payoffs at maturity as well as optimal trading strategies for the large traders are characterized as a result of various equilibrium concepts.

COLLOQUIUM Summer 2010

James S. W. Wong

Department of Mathematics

The University of Hong Kong,
City University of Hong Kong,
and Chinney Investment Ltd., Hong Kong

Thursday, July 29, EMCS 206, 3:30-4:20 pm.

Rectifiable Oscillation of Second Order Ordinary Differential Equations

Abstract. We study oscillation of linear differential equation (E) $y''(x)+a(x)y(x) = 0,\ 0 < x < 1,$ where $a(x)$ is positive and continuous but singular at either $x = 0$ or $x = 1,$ or both. An oscillatory solution $y(x)$ is rectifiable if its graph $G(y) = \{(x, y(x)) : 0 \le x \le 1\}$ as a curve in R^2 has finite arclength, and is called unrectifiable otherwise. We present conditions on $a(x)$ so that all solutions of equation (E) are rectifiable oscillatory or unrectifiable oscillatory. An example is given so that equation (E) can possess both rectifiable and unrectifiable oscillatory solution

The relevant literature can be found in papers listed below :

[1] M.K. Kwong, M.Pasic, J.S.W.Wong, Rectifiable oscillations in second order linear differential equations, J. Diff. Equ., 245(2008), 2333-2351.
[2] M.Pasic, Minkowski-Bouligand dimension of solutions of the one p-Laplacian, J. Diff. Equ., 190(2003), 268-305.
[3] M.Pasic, Rectifiable and unrectifiable oscillations for a class of second order linear differential equations of Euler type, J. Math. Anal. Appl.335(2007), 724-738.
[4] M. Pasic, Fractal oscillations for a class of second order linear differential equation of Euler type, J. Math Anal Appl., 341(2008), 211-223.
[5] M.Pasic, Rectifiable and unrectifiable oscillations for a generalization of Riemann-Weber rersion of Euler differential equations, Georgian Math. J., 15(2008), 759-774.
[6] M. Pasic and J.S.W. Wong Rectifiable oscillations in second order half linear differential equations, Annali di Matematica Pura ed Applicata, 188(2009), 517-541.
[7] M. Pasic and J.S.W. Wong Two-point oscillations in second order linear differential equations, Diff. Equations and Appl., 1(2009), 85-122.
[8] J.S.W. Wong, Oscillation theorems for second order nonlinear differential equations of Euler type, Methods and applications of Analysis, 3(1996), 476-485.
[9] J.S.W. Wong On rectifiable oscillation of Euler type second order linear differential equations, E.J. Qualitative Theory of Diff. Equ., 20(2007), 1-12.
[10] J.S.W. Wong On rectifiable oscillation of Emden-Fowler equations, Memoirs on Differential Equations in Math. Phy., 42(2007), 127-144.

COLLOQUIUM Summer 2010

Ram U. Verma

Department of Mathematics

Seminole State College of Florida

Sanford, FL

Tuesday, August 3, EMCS 206, 3:30-4:30 pm.

Relatively Relaxed Proximal Point Algorithms for Generalized Maximal Monotone Mappings and Douglas-Rachford Splitting Methods

Abstract. The theory of maximal set-valued monotone mappings provides a powerful framework to the study convex programming and variational inequalities. Based on a notion of relatively maximal relaxed monotonicity, the approximation solvability of a general class of inclusion problems is discussed, while generalizing most of investigations on weak convergence using the proximal point algorithm in a real Hilbert space setting. A well-known method of multipliers for constrained convex programming is a special case of the proximal point algorithm. The obtained results can be used to generalize the Yosida approximation, which, in turn, can be applied to generalize first-order evolution equations to the case of evolution inclusions. Furthermore, we observe that the Douglas-Rachford splitting method for finding the zero of the sum of two monotone operators is a special case of the proximal point algorithm too. This allows a further generalization and unification of a wide range of convex programming algorithms.

COLLOQUIUM Fall 2010

Boris P Belinskiy

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Friday, September 17, EMCS 422, 2:00-2:50 pm.

Inverse Problems on Quantum Graphs

Abstract. This presentation is devoted to the general theory of the Inverse Problems (IP) on quantum graphs. The following topics will be discussed. (1) The history of IP, including physical and engineering motivations. (2) The connection between IP and the Boundary Control method for PDE. (3) The definition of a quantum graph. (4) IP on a general quantum graph including a motivation for considering a restricted class of graphs. (5) An idea of the algorithm for the solution of IP on a general (quantum) tree. (6) The list of unsolved problems will be suggested.

The presentation will not contain precise theorems or cumbersome formulas. Instead, the speaker will try to describe the main ideas of this new area of Math Analysis. *

The material is available for the students who have completed ODE and Multivariable Calculus courses.

* Matt Mathews will soon present more specific results on IP on a particular graph including details of the numerical implementation (jointly with Sergei Avdonin and Boris Belinskiy).

COLLOQUIUM Fall 2010

Lingju Kong

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, October 6, EMCS 402, 2:00-2:50 pm.

On Eigencurves for Half-linear Sturm-Liouville Problems *

Abstract. We study the regular two parameter half-linear Sturm-Liouville problem (SLP) consisting of the equation

$$-(p\phi_r(y)) + q\phi_r(y) = (\lambda w + \mu v)\phi_r(y) \quad \text{on } (a,b),$$

and a separated boundary condition, where $\phi_r(u) = |u|^{r-1}u$, and $p, v > 0$ almost everywhere on (a,b). For any $n \in \mathbf{N}_0$, let $\mu_n(\lambda)$ be the n-th real eigenvalue for μ as a function of the parameter λ. We show that $\mu_n(\lambda)$ is continuously differentiable on $\mathbf{R}$, and obtain necessary and sufficient conditions for $\lim_{\lambda\to\pm\infty} \mu_n(\lambda)/\lambda$ to exist. Our results extend some work of Binding and Browne for linear Sturm-Liouville problem to the half-linear problem. This work will help us in the further investigation of left-definite and indefinite half-linear SLPs.

Related References:
[1] P. A. Binding and P. J. Browne, Asymptotics of eigencurves for second order ordinary differential equations, J. Differential Equations 88 (1990), 30–45.
[2] P. A. Binding and P. Drábek, Sturm-Liouville theory for the p-Laplacian, Studia Sci. Math. Hung. 40 (2003), 375–396.
[3] W. Eberhard and Á. Elbert, Half-linear eigenvalue problems, Math. Nachr. 183 (1997), 55–72.
[4] W. Eberhard and Á. Elbert, On the eigenvalues of half-linear boundary value problems, Math. Nach. 213 (2000), 57–76.
[5] Elbert, A half-linear second order differential equations, Coll. Math. Soc. J. Bolyai 30 (1979), 153–180.
[6] L. Kong and Q. Kong, Right-definite half-linear Sturm-Liouville problems, Proc. Royal. Soc. Edinburgh A 137 (2007), 77–92.
[7] L. Kong and Q. Kong, Right-indefinite half-linear Sturm-Liouville problems, Comput. Math. Appl. 55 (2008), 2554–2564
[8] T. Kusano and M. Naito, Sturm-Liouville eigenvalue problems for half-linear ordinary differential equations, Rocky Mount. J. Math. 31 (2001), 1039–1054

* Joint work with Professor Qingkai Kong from Northern Illinois University.

COLLOQUIUM Fall 2010

Sumith Gunasekera

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, October 13, EMCS 402, 2:00-2:50 pm.

Unbalanced Two-way ANOVA Additive Model under Heteroscedasticity using Generalized p-values

Abstract. Two-factor fixed-effect unbalanced additive model without the assumption of equal variances is considered. By taking the generalized p-value approach, the classical F-test for the main effects of the unbalanced additive model is extended to the case of unequal error variances. This generalized F-test can be utilized in significance testing or in fixed level testing under the Neyman-Pearson theory. This non-trivial extension is similar to the generalized F-test for the two-way ANOVA model under heteroscedasticity. Examples are cited to illustrate the proposed test and to demonstrate the significance and verification of this new model that are worthwhile to resort to a numerically extensive testing procedure when the problem of heteroscedasticity is serious or the assumption of homoscedasticity is not reasonable in additive models.

This presentation would be appropriate to Graduate Students as well as to senior Undergraduate Students.

COLLOQUIUM Fall 2010

Aniekan Ebiefung

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, October 27, EMCS 402, 2:00-2:50 pm.

Fulbright Grant Report 2009–2010

Abstract. I was selected as a Fulbright Scholar to Nigeria from September 2009July 2010. In this presentation, I will share with you the activities I performed as a Fulbright scholar to Nigeria. The talk will also include information about the local culture, the expected outcome of my Fulbright experience, and the benefits of the Fulbright award to the scholar and UTC. This talk is nontechnical but full of information that should be beneficial to all in the UTC community.

This presentation would be appropriate to Graduate Students as well as to senior Undergraduate Students.

COLLOQUIUM Fall 2010

Ronald L. Smith *

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Tuesday, November 16, EMCS 422, 4:30-5:30 pm.

Positive (Semi-)Definite Completions

Abstract. In [GJSW] the positive definite (semi-) completion problem in which the underlying graph is chordal was solved. For the positive definite case, the process was constructive and the completion was obtained by completing the partial matrix an entry at a time. For the positive semidefinite case, they obtain completions of a particular sequence of partial positive definite matrices with the same underlying graph and note that there is a convergent subsequence of these completions that converges to the desired completion. Here, in the chordal case, we provide a constructive solution, based entirely on matrix/graph theoretic methods, to the positive (semi-) definite completion problem. Our solution associates a specific tree (called the "clique tree" [JL]) with the (chordal) graph of the given partial positive (semi-) definite matrix. This tree structure allows us to complete the matrix a "block at a time" as opposed to an "entry at a time" (as in [GJSW] for the positive definite case). In [GJSW], using complex analytic techniques, the completion for the positive definite case was shown to be the unique determinant maximizing completion and is shown to be the unique completion that has zeros in its inverse in the positions corresponding to the unspecified entries of the partial matrix. Here, we show the same using only matrix/graph theoretic tools.

[JL] C. R. Johnson, pp.171–198 *Matrix completion problems: a survey*, 1990, vol. 40, Proc. Sympos. Appl. Math., Amer. Math. Soc., Providence

[GJSW] R. Grone, C. R. Johnson, E. Sa, and H. Wolkowicz, pp. 109–124 *Positive definite completions of partial Hermitian matrices*, 1984, vol. 58, Linear Algebra Appl.

* The work of this author was supported, in part, by the University of Chattanooga Foundation.

This presentation would be appropriate to Graduate Students as well as to senior Undergraduate Students.

COLLOQUIUM Spring 2011

Matt Matthews

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, February 9, EMCS 232, 2:00-3:00 pm.

A Dynamical Inverse Problem on a Metric Graph

Abstract. We present an algorithm based on the Boundary Control method for reconstruction of the potential for the wave equation on a particular star-shaped graph, representative of a small part of a quantum circuit. The practicality of the algorithm is demonstrated through a numerical implementation which recovers a variety of potentials. Together the algorithm and implementation provide a fundamental first step for reconstructing potentials on a larger metric tree.

* This research was supported by the Mathematics Department, University of Tennessee at Chattanooga.

This presentation will be accessible to graduate students and upper-level undergraduates.

COLLOQUIUM Spring 2011

Francesco Barioli and Lucas van der Merwe

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Tuesday, February 15, EMCS 422, 3:00-4:00 pm.

On the Maximum Order of 3_t-Critical Graphs *

Abstract. A set S of vertices in a graph G is a total dominating set of G if every vertex of G is adjacent to some vertex in S. The minimum cardinality of a total dominating set of G is the total domination number $\gamma_t(G)$ of G. The graph G is 3_t-critical if $\gamma_t(G) = 3$ and $\gamma_t(G + e) = 2$ for every edge e in the complement of G. We give a general upper bound on the order of 3_t-critical graphs in terms of the maximum degree. We also establish sharp upper bounds on the order for families of 3_t-critical graphs in terms of the maximum degree. These results also provide a lower bound for the maximum degree of 3_t-critical graphs.

* Research supported by the Mathematics Department, University of Tennessee at Chattanooga.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Steve Kuhn *

Department of Mathematics

and
Sandy Watson *

School of Education

* **Co-directors, UTeaChattanooga**

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, February 23, EMCS 239, 3:30-4:30 pm.

UTeaChattanooga: Program and Progress

Abstract. UTeaChattanooga is the new program at UTC to produce more secondary mathematics and science teachers. It is a based on the successful UTeach program at the University of Texas in Austin, where it began in 1997. In this presentation we will discuss: the elements that make the program successful at UT-Austin, including early teaching experiences, STEM majors for all students, and support after graduation; the progress we have made since starting UTeaChattanooga last year, including the new courses and degree concentrations, and how they mesh with the current STEM and Education degree programs; and the planned developments in the program over the next few years.

This presentation is especially appropriate for faculty and students in all STEM (Science, Technology, Engineering, and Mathematics) disciplines.

COLLOQUIUM Spring 2011

Meg Kiessling

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, March 2, EMCS 239, 3:30-4:20 pm.

Successfully Implemented Tennessee Higher Education Commission (THEC) Improving Teacher Quality (ITQ) Grants *

Abstract. Meg Kiessling will present the results from three years of providing THEC ITQ grants for middle school mathematic teachers. Megs grant was titled EXPLORE-ing Middle School Mathematics since it targeted mathematics covered in the EXPLORE test as well as the Tennessee State Mathematics Curriculum Standards.

* Research was supported by Math Department at UTC.

This presentation is appropriate for students and faculty interested in mathematics education and/or the grant writing process as it relates to THEC sponsored grants.

COLLOQUIUM Spring 2011

Deborah Shepherd

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, March 9, EMCS 239, 3:30-4:30 pm.

Runs Rules for an Attribute Chart for Monitoring a Markov Process

Abstract. A tool used with a considerable amount of success in industry for monitoring the quality of a production process is the quality control chart. Generally a control charting procedure uses a sequence, $X_1, X_2, ..., X_t, ...$ of the quality measures to make a decision about the quality of the process. How this sequence is used to make a decision defines the control chart. In the control chart in this presentation, a sequence of random variables, X_i, $i = 1, 2, ...$ is used to classify an item as conforming or non-conforming under a stationary Markov chain model and under 100% sequential sampling. The chart plots a sequence of measures on the control chart, Y_i, $i = 1, 2, ...$, that count the number of conforming items before a non-conforming item. Three runs rules are considered for detecting a shift in the proportion of nonconforming items. These rules may be stated in the following form: (1) An out-of-control signal is given if a value of Y_i, $i = 1, 2, ...$, falls below a certain lower limit. (2) An out-of-control signal is given if two out of two values of Y_i, $i = 1, 2, ...$, fall below a certain lower limit. (3) An out-of-control signal is given if there is a trend in the values of Y_i, $i = 1, 2, ...$. The efficiency of the control charts using the different runs rules is evaluated by the average run length (ARL) of the chart and the power of the chart to detect a shift in the process.

This talk is especially appropriate for students and faculty interested in statistics.

COLLOQUIUM Spring 2011

Tankut Dogrul

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Wednesday, March 23, EMCS 219, 1:00-1:50 pm.

A Nash Equilibrium with Several Large Traders

Abstract. Motivated by the problem of pricing financial assets in incomplete markets due to the presence of price impact, an equilibrium model with a representative market maker and a finite number of large traders is considered. Prices for (illiquid) European contingent claims with payoffs at maturity as well as optimal trading strategies for the large traders are characterized as a result of various equilibrium concepts such as Nash, Subgame Perfect Nash and Arrow-Debreu. In this talk, we will focus on an example with Brownian Asset structure and exponential utilities to obtain explicit results.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Georgi Kapitanov

Department of Mathematics

Vanderbilt University

Nashville, TN

Wednesday, April 13, EMCS 407, 2:00-2:50 pm.

Mutation-Generation Model of Cancer Formation

Abstract. Cancer occurs when cells acquire a sequence of mutations. This sequence determines a hierarchy among the cells, based on how close they are to becoming cancerous. When cells divide, they exhibit telomere loss, which also defines a cell hierarchy. The mutation-generation model I propose combines the cancer-acquisition hierarchy with the telomere hierarchy of the cells, allowing us to take a step further in examining cancer acquisition and growth. Dividing all cells in a tissue into classes based on how many telomeres they have and how many mutations they have undergone, we examine the growth of these classes. The presentation features a linear model and a nonlinear extension of the model that includes a crowding term. The results, depending on parameters, are either extinction of all cells, polynomial time growth for the linear model, and steady-state comprised entirely of cancer cells for the non-linear model.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Sat Gupta *

Wednesday, April 20, EMCS 407, 3:00-3:50 pm.

Department of Mathematics and Statistics

The University of North Carolina at Greensboro

Parameter Estimation in Two-Stage Optional Randomized Response Models

Abstract. Randomized response models, introduced by Warner (1965), are important data acquisition tools in survey sampling when the researcher is faced with sensitive questions. These models allow a respondent to provide a scrambled response and the researcher is able to unscramble the responses at an aggregate level but not at an individual level. Such models have applications in many fields, most notably in health and behavioral sciences. An optional randomized response model, introduced by Gupta, Gupta and Singh (2002), is a variation of the usual randomized response model and is based on the basic premise that a question may be sensitive for one respondent but may not be sensitive for another, and hence the choice to provide a truthful response or a scrambled response should be left to the respondent. Gupta, Shabbir and Sehra (2010) have recently introduced a two-stage optional RRT model that provides further improvement over the one-stage optional randomized response model. In this talk we will discuss:

- Background of randomized response models
- Theoretical framework of the optional randomized response model
- Asymptotic properties of the parameter estimators
- Some optimality issues, and
- Simulation results

* Professor Gupta is a candidate for the position of Chair of Excellence in Applied Mathematics.
This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Ilya Sitkovsky *

Department of Mathematics

The College of William & Mary, Williamsburg, VA

Wednesday, April 27, EMCS 407, 3:00-3:50 pm.

On some current trends in the factorization theory

Abstract. We will give an overview of Wiener-Hopf factorization theory, describe some (old but still open) problems, and will also mention current trends. In particular, we will introduce the notion of almost periodic factorization, explain its roots and demonstrate the challenges it presents.

* Professor Spitkovsky is a candidate for the position of Chair of Excellence in Applied Mathematics.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Yumin Wang *

Department of Mathematics

State University of New York at Binghamton

Binghamton, NY

Monday, May 2, EMCS 422, 4:00-4:50 pm.

Quantile Hedging for Guaranteed Minimum Death Benefits within Variable Annuity

Abstract. Quantile hedging for contingent claims is an active topic of research in mathematical finance. It plays a role in incomplete markets when perfect hedging is not possible. Guaranteed minimum death benefits (GMDBs) are present in many variable annuity contracts, and act as a form of portfolio insurance. They cannot be perfectly hedged due to the mortality component, except in the limit as the number of contracts becomes infinitely large. In this article, we apply ideas from finance to derive quantile hedges for these products under various assumptions.

* Dr. Wang is a candidate for a tenure-track position in the Mathematics Department.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Katerina Tsakiri *

Department of Environmental Engineering Sciences

University of Florida

Gainesville, FL

Wednesday, May 4, EMCS 422, 2:00-2:50 pm.

Decomposition of Time Series and its Applications

Abstract. A methodology is described for separating the different time scale components in a time series, namely, long term component, seasonal component, and synoptic scale component. This method has been applied for the prediction of ozone concentrations in Albany, New York and the explanation of the water use time series in Gainesville, Florida. The Canonical Correlation Analysis, the vector autoregressive model and the Kalman filter have been used for the analysis. The results indicate that solar radiation is the main atmospheric factor for the prediction of the ozone time series, and the climatic variables influence the water use time series. By using the decomposition of the time series, the prediction of ozone and the explanation of the water use have been improved approximately two times.

* Dr. Tsakiri is a candidate for a tenure-track position in the Mathematics Department.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Michael D. Sherman * **and Ronald L. Smith**

Department of Mathematics

University of Tennessee at Chattanooga

Chattanooga, TN

Friday, May 6, EMCS 422, 10:00-10:50 am.

Characterization of Principally Normal Matrices

Abstract. Matrix $A \in C^{n\times n}$ is said to be a normal if it commutes with its conjugate transpose, i.e., $AA^* = A^*A$. Generally it is not the case that all principal submatrices of a normal matrix are themselves normal. If this condition does in fact hold, we say the matrix is principally normal (PN). A number of characterizations of this class will be presented. Notably, the eigenvalues of an irreducible PN matrix all lie on the same line in the complex plane, interlacing with the eigenvalues of the principal submatrices.

This presentation will include a brief introduction to hermitian, unitary, and normal matrices; it is appropriate for undergraduate and graduate students.

* The speaker

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Miroslav Bartusek

Department of Mathematics

Masaryk University
Brno, The Czech Republic
Monday, May 23, EMCS 422, 2:00-2:50 pm.

Limit-point/Limit-circle Problem for Second Order Ordinary Differential Equations

Abstract. One hundred years ago, H. Weyl initiated a problem where all solutions of a linear second order differential equation are in L_2 (limit-circle problem) or not in L_2 (limit-point problem). In this lecture these problems are generalized to nonlinear second order differential equations with a $p-$ Laplacian and a delay.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.

COLLOQUIUM Spring 2011

Jeff Webb

Department of Mathematics

University of Glasgow

Glasgow, Scotland, UK

Monday, May 30, EMCS 422, 2:00-2:50 pm.

Positive Linear Operators and Nonlinear Boundary Value Problems

Abstract. We discuss some positive linear operators (relative to a cone) and their application to some nonlinear boundary value problems.
We present a new proof of an old result of Krasnosel'skiĭ concerning the existence of a positive eigenvalue of a positive compact linear operator.
Nonlinear boundary value problems with either local or nonlocal boundary conditions lead to the study of solutions of integral operators, defined in terms of the Green's function. When the Green's function satisfies a strict positivity condition the corresponding linear operator is shown to belong to a new class of positive linear operators, a modification of the class of u_0 -positive linear operators of Krasnosel'skiĭ.
Using a comparison theorem for this class of linear operators, we obtain new existence results for multiple positive solutions of some differential equations with suitable boundary conditions, especially nonlocal ones, under conditions which depend solely on the principal eigenvalue of the corresponding linear operator.

This presentation would be appropriate to the graduate students as well as to the senior undergraduate students.