

Course No.: MATH 617	Core Course: No.
Course Title: Topics in Functional Analysis.	Term: Fall 2017
Instructor: Vladimir Troitsky	
<p>Syllabus: Most of the spaces arising in Functional Analysis have natural partial order structures. This course will focus on the role of order in Functional Analysis. The main object of the course is the concept of a Banach Lattice, which is a Banach space equipped with a lattice order, such that the vector, the order, and the topological structures satisfy some natural compatibility axioms. Simply said, a Banach lattice is a Banach space with a nice order. Most classical Banach spaces are, in fact, Banach lattices. In particular, $L_p(\mu)$ and $C(K)$ are Banach lattices (relative to the point-wise order). We will also consider operator theory on Banach lattices. An operator is positive if it takes positive vectors to positive vectors. Positive operators have many special properties.</p> <p>We will discuss representation theorems for Banach lattices. On one hand, every Banach lattice may “locally” be represented as the space $C(K)$ of continuous functions on a compact Hausdorff space, which connects Banach lattices with topology. On the other hand, under some mild assumptions, a Banach lattice may be realized as a space of integrable functions on a measure space; this connects Banach lattice theory with Measure Theory.</p> <p>Banach lattices and positive operators arise naturally in various applications, including Math Economics and Math Finance, dynamical systems, Stochastic Analysis, ranking algorithms, etc.</p> <p>Topics to be covered:</p> <ol style="list-style-type: none"> 1. Vector and Banach lattices 2. sublattices and order ideals 3. Order completeness 4. Positive operators and positive functionals 5. $C(K)$ and $L_1(\mu)$ representations of vector and Banach lattices 6. Order continuous Banach lattices 7. Positive matrices and Perron-Frobenius theory 	
Pre- or corequisite: a basic Functional Analysis course, e.g., Math 516	
Textbook: Notes will be provided by the instructor	
Grading (tentative): homework: 40%, midterm: 30%, final exam: 30%.	