Information sheet for Math 528 Spring 2016

Class meets: MTRF 12:00 - 12:50 pm in BH 151

Instructor: Branko Ćurgus **Office:** BH 178 **Office Hours:** MTRF 10am

Course website: `http://faculty.wwu.edu/curgus/Courses/528_201620/528.html`

Text: *An introduction to Hilbert space, Third edition* by Nicholas Young

Material covered: My plan is to cover most of the first 11 chapters.

Student Learning Outcomes. By the end of this course, a successful student will demonstrate: The successful student will demonstrate: (1) knowledge of the definitions of metric spaces, normed vector space, Banach spaces, inner product spaces and Hilbert spaces; (2) knowledge of the classical examples of the spaces listed in (1) with ability to prove all their defining properties; (3) understanding of the concepts of completeness, separability, orthogonality, orthonormal bases and dimension in a Hilbert space setting; (4) ability to state and prove the fundamental theorems about inner product spaces and Hilbert spaces (Cauchy-Schwarz-Bunyakovsky inequality, the parallelogram law, the closest point property (the best approximation theorem), Bessel's inequality, the orthogonal complement theorem, the Riesz-Fréchet theorem); (5) understanding of classical Fourier series in a Hilbert space setting; (6) understanding of the definition of a bounded linear operator between two normed spaces, the norm of such an operator, and the basic properties of the space of all such operators; (7) understanding of the concept of the adjoint of an operator between two Hilbert spaces and the concept of a bounded self-adjoint operator on a Hilbert space; (8) understanding of the concept of the spectrum of a bounded linear operator on a Banach space and its basic properties with knowledge of their proofs; (9) ability to state and prove the spectral theorem for compact self-adjoint operators and understanding how it applies to regular Sturm-Liouville boundary eigenvalue problems; (10) ability to use concepts and theorems covered in the course to solve problems and prove new propositions.

Assessment. The assessment of Learning Outcomes will be done through exams and assignments. There will be two "mid-term" exams and a comprehensive final exam. The "mid-term" exams are scheduled as follows: Tuesday, April 26, 2016 and Tuesday, May 24, 2016. The final exam is scheduled for three hours on Tuesday, June 7, 2016 from 8am to 11am. (Notice that the final exam time is set by the school. I did my best to copy it right from the schedule. Please verify that I did it right.) Also notice that I extended the duration of the final by one hour. If you are unable to take an exam for a very serious reason verified in writing, please see me beforehand. This does not apply to the final exam which cannot be taken neither early nor late. On each exam I will assign one or two questions related to the theory presented in class (a proof of an important theorem for example) and two problems. One of these problems might be a problem discussed in class or an exercise from the book.

There will be two written homework assignment. Each assignment will be handed out in class one week before it is due. The assignment will be graded and the grade will count towards the final grade.

Homework. Your daily homework should consist of studying the material covered in class. Proofs that I will present in class will sometimes differ from the proofs in the textbook. Study both: your class notes and the book. Analyze the similarities and the differences. This will help you to internalize the concepts and the methods that are being studied. Exercises in the book are there to enhance and challenge the learning process. Use them.

Grading. Each exam and assignment will be graded by an integer between 0 and 100. Your final grade will be determined using the following formula

$$\texttt{FG} = \lceil \texttt{0.2*E1 + 0.2*E2 + 0.1*A1 + 0.1*A2 + 0.4*FE} \rceil .$$

Your letter grade will be assigned according to the following table.

F : 0 - 49	D : 50 - 54	C−: 55 - 59	C : 60 - 64	C+: 65 - 69
B−: 70 - 74	B : 75 - 79	B+: 80 - 84	A−: 85 - 89	A : 90 - 100

Remarks. This is a fast-paced course. It builds on the concepts that you learned in undergraduate linear algebra courses and some ideas from calculus. It is essential that you keep up with the material presented every day. Do the exercises at the end of each chapter. Look for help if you encounter difficulties.

Remember that the best way to learn mathematics is to discuss it with others: other students in this class, students that took this class before, and me. I will be glad to talk to you during my office hours, or you can make an appointment.