

**MATH 6360**  
**Analysis with Applications**  
**Fall 2018**

**Class:** MWF 10am-10:50pm, AH (Agnes Arnold Hall) 201

**Instructor:** Bernhard Bodmann, *bgb@math.uh.edu*

**Office:** PGH 604; Tu 1-2pm, Th 1-2pm

**Objectives:** This course covers topics in analysis that are motivated by applications. The implicit and inverse function theorem of multivariate calculus are derived from the contraction mapping principle, as well as existence and uniqueness of solutions to initial value problems. Banach and Hilbert spaces, together with the study of operators on these spaces, provide an introduction to techniques of functional analysis that are needed in many applications. The students are assumed to be familiar with properties of sets and functions in Euclidean spaces such as in Math 4331, as well as elementary linear algebra as covered in Math 2331 or Math 4355.

<b>Contents:</b>	<i>Topic</i>	<i>Duration</i>	
	Metric spaces	Compactness, completeness	1 week
	Contraction mappings	iterated maps & convergence	1 week
	Multivariate calculus	inverse and implicit function theorem	1 week
	Differential equations	existence of solutions, stability	2 weeks
	Continuity and integrals	$L^p$ -spaces without Lebesgue	1 week
	Banach spaces	duality	2 weeks
	Hilbert spaces	best approximation	1 week
	Fourier series	convergence	1 week
	Linear operators	spectral theorem	2 weeks
	Integral operators	Fredholm alternative	1 week

**Prerequisites:** Math 4331 and elementary linear algebra.

**Text:** John Hunter and Bruno Nachtergaele, Applied Analysis, available online at <https://www.math.ucdavis.edu/~hunter/book/pdfbook.html>  
 another book from which I may draw supplementary material: Kenneth Davidson and Allan Donsig, Real Analysis and Applications, Theory in Practice, Springer, New York, 2010.

**Assignments:** There will be approximately 10 homework sets.

**Exams, Grades:** The midterms are in class, Sept 28 and Nov 16, the final as scheduled by the registrar. The midterms count 20% each, homework and final contribute 30% to your grade.

**Disabilities:**

If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, please notify the instructor as soon as possible. Students are also welcome to contact the Center for Students with DisABILITIES at 713-743-5400 or [uhcsd@central.uh.edu](mailto:uhcsd@central.uh.edu) to discuss a range of options to removing barriers in the course, including reasonable academic adjustments/auxiliary aids in accordance with the Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 guidelines.

**Counseling:**

Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS ([www.uh.edu/caps](http://www.uh.edu/caps)) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the “Let’s Talk” program, a drop-in consultation service at convenient locations and hours around campus. [http://www.uh.edu/caps/outreach/lets\\_talk.html](http://www.uh.edu/caps/outreach/lets_talk.html)