

 FLORIDA ATLANTIC UNIVERSITY	COURSE CHANGE REQUEST Graduate Programs		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department <u>MATHEMATICAL SCIENCES</u> College <u>CHARLES E. SCHMIDT COLLEGE OF SCIENCE</u>		
Current Course Prefix and Number MAA 6306		Current Course Title Real Analysis 1	
<i>Syllabus must be attached for ANY changes to current course details. See Guidelines. Please consult and list departments that may be affected by the changes; attach documentation.</i>			
Change title to: <u>Real Analysis</u>		Change description to: Abstract measure theory. The Lebesgue integral. Convergence, Radon Nikodym, and Fubini theorems. L_p spaces and selected topics. (original description: none)	
Change prefix From: N/A To: N/A		Change prerequisites/minimum grades to: MAA 5229 WITH A GRADE OF "C" OR HIGHER (ORIGINAL PREREQUISITES: NONE) Change corequisites to: N/A Change registration controls to: N/A Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade.	
Change course number From: N/A To: N/A			
Change credits* From: N/A To: N/A			
Change grading From: N/A To: N/A			
*Review Provost Memorandum			
Effective Date (TERM & YEAR) Spring 2017		Terminate course List final active term	
Faculty Contact/Email/Phone Tomas Schonbek , schonbek@fau.edu, 561-297-3355			
Approved by		Date	
Department Chair <u></u>		<u>10-24-16</u>	
College Curriculum Chair <u></u>		<u>10-24-16</u>	
College Dean <u>Dr. Charles Roberts</u>		<u>11/7/2016</u>	
UGPC Chair _____		_____	
Graduate College Dean _____		_____	
Provost _____		_____	

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

Syllabus

1. COURSE TITLE	COURSE NUMBER	CREDIT HOURS
Real Analysis	MAA 6306	3

2. COURSE PREREQUISITES

MAA 5229 Introductory Analysis 2 with a grade of "C" or higher

3. COURSE LOGISTICS

- Spring 2017.
- Taught in lecture-discussion style in-person (not online).
- Course location is specified in the FAU course schedule.

4. INSTRUCTOR CONTACT INFORMATION

Tomas Schonbek, Office SE 288

Phone: (561) 297-3355, fax (561) 297-2436

E-mail address: schonbek@fau.edu

Office hours: Monday and Wednesday 9:30am–11:30am

5. TA CONTACT INFORMATION

N/A

6. COURSE DESCRIPTION

Abstract measure theory. The Lebesgue integral. The Lebesgue Convergence, Radon Nikodym, and Fubini theorems. L^p spaces and selected topics.

7. COURSE OBJECTIVES

This course is a steppingstone for other courses; the topics students learn in this course are part of the standard tool kit of all mathematicians specializing in any of the many areas of mathematical analysis. Upon successful completion of the course, students will have learned the basics of measure theory and integration and be prepared to take advanced courses in differential equations, probability, functional analysis and physics.

8. COURSE EVALUATION METHOD

There will be three homework projects $\{H_1, H_2, H_3\}$, each having a maximum score of 20 points. Homework project H_1 will be assigned in the 3rd week of classes, homework project H_2 will be assigned in the 7th week of classes, and homework project H_3 will be assigned in the 11th week of classes. The exact assignment due date will be specified on each assignment. Graded homework projects will be returned in class or can be picked up during office hours in the instructor's office.

In addition, there is a cumulative final exam, which is scheduled in accordance with FAU's final exam schedule. The maximum score for the final exam is 40 points.

9. COURSE GRADING SCALE

Your overall grade in the course is derived from your cumulative performance as follows:

- 1) The points from the items H_1 , H_2 , H_3 and the final exam are added, yielding a final number of points $0 \leq P \leq 100$.
- 2) Your grade is derived from P according to the following table.

Value of P	Grade
>94	A
>90 – 94	A-
>87 – 90	B+
>83 – 87	B
>80 – 83	B-
>75 – 80	C+
>65 – 75	C
>60 – 65	C-
>57 – 60	D+
>53 – 57	D
>50 – 53	D-
<50	F

10. POLICY ON MAKEUP TESTS, LATE WORK, AND INCOMPLETES

If you cannot complete an assignment in due time to a relevant and documented reason, you can make up the respective assignment. Extra credit work is not possible.

A grade of I (incomplete) will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student has to show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate.

11. SPECIAL COURSE REQUIREMENTS

N/A

12. CLASSROOM ETIQUETTE POLICY

N/A

13. DISABILITY POLICY STATEMENT

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) located in Boca Raton - SU 133 (561-297-3880), in Davie - MOD 1 (954-236-1222), in Jupiter - SR 117 (561-799-8585), or at the Treasure Coast - CO 128 (772-873-3305), and follow all OSD procedures.

14. CODE OF ACADEMIC INTEGRITY POLICY STATEMENT

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf.

15. REQUIRED TEXTS/READINGS

A standard textbook for the course is *Real Analysis*, by H.L. Royden and P.M. Fitzpatrick, 4th Edition, Pearson 2010.

16. SUPPLEMENTARY READINGS

The following references can supplement the material covered in class.

- L.C. Evans and R.F. Gariepy, *Measure Theory and Fine Properties of Functions*, CRC Press, Taylor and Francis Group, 2015.
- Kenneth Falconer, *Fractal Geometry, Mathematical Foundations and Applications*, Third edition, Wiley 2014.

17. COURSE TOPICAL OUTLINE

The following topics are to be covered. The exact duration per topic will vary in dependence on prior experience of the class participants, but a typical duration per topic is two to two and a half weeks.

- 1) General Measure Spaces. The Hahn and Jordan decompositions and the Caratheodory extension theorem.
- 2) Integration over general measure spaces, the convergence theorems of Egoroff, Fatou and Lebesgue.
- 3) Derivation of measures and the Radon-Nikodym Theorem.
- 4) General L^p spaces. Completeness of these spaces and duality theorems. The theorems of Alaoglu and Dunford-Pettis.
- 5) Product measures. The theorems of Fubini and of Fubini-Tonelli. Lebesgue measure in \mathbb{R}^n .
- 6) An introduction to Hausdorff measure and Hausdorff dimension.

18. WEEKLY SCHEDULE

Week # 1: General Measure Spaces. The Hahn and Jordan decompositions.

Week #2: Outer measures. The Caratheodory extension theorem.

Week #3: Measurable functions. Integration of non-negative measurable functions. The Lebesgue integral in a general measure space. First properties.

Week #4: The theorems of Egoroff, Fatou; Lebesgue's monotone convergence theorem and Lebesgue's dominated convergence theorem.

Week #5: Absolutely continuous and singular measures with respect to a positive measure.

Week #6: The Radon-Nikodym and the Lebesgue decomposition theorems. Derivation of measures.

Week #7: A brief introduction to normed vector spaces and Banach spaces.

Week #8: General L^p spaces. Completeness of these spaces.

Week #9: The $(L^p, L^{p'})$ duality, $\frac{1}{p} + \frac{1}{p'} = 1$.

Week #10: Weak and strong convergence in L^p spaces; the theorems of Alaoglu and of Dunford-Pettis.

Week #11: The product of measures spaces; product measures.

Week #12: The theorems of Fubini and Fubini-Tonelli

Week #13: Lebesgue measure in \mathbb{R}^n . Change of variables.

Week #14: An introduction to Hausdorff measure.

Week #15: Hausdorff dimension. Fractals.