

FLORIDA ATLANTIC UNIVERSITY™

Graduate Programs—COURSE CHANGE REQUEST¹

UGPC APPROVAL _____
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 CATALOG _____

DEPARTMENT: MATHEMATICAL SCIENCES	COLLEGE: SCIENCE
COURSE PREFIX AND NUMBER: MHF 6107	CURRENT COURSE TITLE: SET THEORY
CHANGE(S) ARE TO BE EFFECTIVE (LIST TERM):	TERMINATE COURSE (LIST FINAL/ACTIVE TERM):
CHANGE TITLE TO: CHANGE PREFIX FROM: TO: CHANGE COURSE NO. FROM: 5107 TO: 6107 CHANGE CREDITS FROM: TO: CHANGE GRADING FROM: TO: CHANGE DESCRIPTION TO:	CHANGE PREREQUISITES/MINIMUM GRADES TO*: CHANGE COREQUISITES TO*: CHANGE REGISTRATION CONTROLS TO: *Please list both existing and new pre/corequisites, specify AND or OR, and include minimum passing grade.
Attach syllabus for ANY changes to current course information.	
Should the requested change(s) cause this course to overlap any other FAU courses, please list them here.	Please consult and list departments that might be affected by the change(s) and attach comments.

Faculty contact, email and complete phone number:
 Robert Lubarsky, rlubarsk@fau.edu, 297-3341

Approved by: Department Chair: <u>Lee Klingler</u> College Curriculum Chair: <u>[Signature]</u> College Dean: <u>[Signature]</u> UGPC Chair: <u>[Signature]</u> Graduate College Dean: <u>[Signature]</u> UFS President: _____	Date: <u>4/9/13</u> <u>4/29/13</u> <u>4/25/13</u> <u>9-11-13</u> <u>9.12.13</u>	<ol style="list-style-type: none"> 1. Syllabus must be attached; see guidelines for requirements: www.fau.edu/provost/files/course_syllabus.2011.pdf 2. Review Provost Memorandum: Definition of a Credit Hour www.fau.edu/provost/files/Definition_Credit_Hour_Memo_2012.pdf 3. Consent from affected departments (attach if necessary)
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Email this form and syllabus to UGPC@fau.edu **one week before** the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

PROPOSAL FOR COURSE NUMBERING CHANGE

SET THEORY – FROM 5107 TO 6107

When set theory was first taught at FAU, the intent was to give all math grad students a grounding in the foundations of mathematics. It was a required qualifying exam, and the course was to prepare the students for that exam. The topics were cardinality (countable/uncountable), the Axiom of Choice, and ordinals, perhaps the ZF axioms.

The foundations qualifying exam no longer exists, and the course now serves a completely different purpose, to introduce those who are interested to modern set theory. Some come to FAU wanting to work in foundations, others choose to pursue foundations once they find out what it's like, still others just want the exposure, which can be useful later in case set theoretic questions come up in their own work later.

The difference in content between the old course and the new is that, while it must still contain the same classical set theory as before for background the course is now rigorous and includes modern set theory. On the technical side, this consists primarily in forcing and large cardinals. Forcing showed the Continuum Hypothesis to be independent of ZFC, and, combined with large cardinals, shifted the view of set theory from an absolute subject to a relative one, wherein one talks as much about models of set theory as of what happens with the sets within any particular model. To enable a more rigorous discussion of such technical topics, a 6000-level designation of the course seems adequate.

Set Theory

MHF 6107

CREDITS: 3
PRE-REQS: Analysis (MAA 5228) and Algebra (MAS 5311) or permission of the instructor.
TERM: Fall or Spring, 20XX
TIME & ROOM:
INSTRUCTOR: Robert S. Lubarsky
OFFICE: SE 206
OFC HOURS: TBA
TELEPHONE: (561) 297-3341 (ofc), (954) 396-3208 (home)
EMAIL: rlubarsk@fau.edu

DESCRIPTION: To introduce students to set theory, as currently practiced, and related topics in the foundations of mathematics. This course could well be titled "Set Theory for the Working Mathematician." The target audience is a generic mathematician, someone who could be working in any branch of pure mathematics, not just foundations. The first part of the course will be an exploration of those contributions of set theory which now permeate mathematics (ordinals, cardinals, the Axiom of Choice) and set theory's foundational role (the paradoxes, standard set-theoretic axioms, the development of mathematics within set theory) – classical set theory. The second part will be modern set theory, characterized by forcing and large cardinals, and its contribution to other mathematical disciplines, namely analysis, combinatorics, and algebra. The goal of this rather ambitious program is less to make you fluent in any particular realm than to enable you to have a useful conversation with your local set theorist or logician.

OBJECTIVES: The students should understand the following:

- ordinality
- cardinality
- the ZFC axioms and related principles
- set theory as a foundation for mathematics
- the paradoxes
- independence proofs
- forcing
- large cardinals
- determinacy.

EVALUATION: There will be graded homework assignments accounting for 40% of the student's cumulative performance, a midterm exam, accounting for 30% of the student's cumulative performance, and a final exam that accounts for 30% of the cumulative performance. The overall grade in the course is derived from the cumulative performance according to the following table.

>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

MAKE-UP EXAMS: If a student cannot attend an exam or hand in a homework project on time due to circumstances beyond their control then the instructor may assign appropriate make-up work. Students will not be penalized for absences due to participation in University-approved activities, including athletic or scholastics teams, musical and theatrical performances, and debate activities. These students will be allowed to make up missed work without any reduction in the student's final course grade. Reasonable accommodation will also be made for students participating in a religious observance. Also, note that grades of Incomplete ("I") are reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances. A grade of "I" 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 must 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.

ATTENDANCE: Students are expected to attend all classes, except for the reasons mentioned in the make-up exams section. More than five unexcused absences will result in a deduction of at least 10 points from the overall average of the exams grade. Non-attendance, whether excused or not, does not diminish students' responsibility for keeping up with the class and receiving any materials handed out in class.

CLASSROOM ETIQUETTE: University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions."

SPECIAL ACCOMMODATIONS: 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 the Office for Students with Disabilities (OSD) located in Boca Raton in SU 133 (561-297-3880) and follow all OSD procedures.

HONOR CODE POLICY STATEMENT: Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty 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.

SAMPLE TEXT: Fundamentals of Mathematical Logic, P. Hinman, A. K. Peters, 2005.

SUPPLEMENTARY READINGS: Set Theory, Thomas Jech, Springer.
Set Theory, Kenneth Kunen, North Holland.

OUTLINE:

- The ZF axioms, including well-foundedness, Collection, and Reflection (6.1, do #1-4)
- Mathematics in set theory (6.2, do #2,4,5,7)
- Well-orders and ordinals (6.3, do #2-6)
- Cardinality and cardinals, including CH and GCH (6.4, do #2, 4-8)
- Russell's and other paradoxes (6.5, do #1-3)
- The Axiom of Choice (6.5, do #5-8)
- Construction of \mathbf{N} , \mathbf{Z} , \mathbf{Q} , and \mathbf{R} (6.6, do #2-5)
- \mathbf{L} (6.7, do #3,5,6,9,10)
- Forcing (6.8-9, do 6.8 #1-4, 6.9 #2-6)
- The independence of CH and cardinal collapse (do 6.9 #7,8)
- Large cardinals (6.10, do #1,4,5,7,8)