MATH 590
Mathematics of Fermat's Last Theorem
Nicholls State University, Fall 2010

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My office hours are 8:30-11:30 T/Th and 8:30-1:30 F. Please contact me (phone, email, or in person) during these times if you have any questions. If you need assistance at a different time, let me know and we'll work something out.

Prerequisite: MATH 358 or permission of department.

Text: There is no required text. We will use notes posted to Blackboard routinely throughout the semester.

Course Description (catalog): Selected current topics in mathematics. May be repeated for credit if content differs. No student may apply more than six hours toward graduation.

Course Description (instructor): In 1637, Pierre Fermat was reading about the Pythagorean Theorem (how a square could be divided into two other squares) and remarked in the margin of the book he was reading:

> "However, it is impossible to separate a cube into two cubes, or a fourth power into two fourth powers, or in general any power higher than the second into two powers of like degree. I have discovered a truly remarkable proof which this margin is too small to contain."

As often happens, this innocuous comment instigated 350 years of research. Mathematicians attempted to find Fermat's proof (for he died before revealing it) or to produce one of their own. Most failed. It was eventually assumed that Fermat was either teasing his colleagues (and did not really have such a proof) or more likely his proof was incorrect. By the late 20th century, British mathematician Andrew Wiles successfully proved Fermat's Last Theorem using some of the most cutting edge algebraic and analytic number theory of his time. In this course, we will discuss the history of the problem, the various attempts (and struggles) at proving it, and roughly sketch out the proof including relevant necessary mathematics.

A few words need to be said about the Internet aspect of this course. All assignments, notes, announcements, etc will be posted on Blackboard. All students enrolled in an Internet course should have basic computer skills (such word processing, e-mail, navigating the Internet, etc). As an online student, you will be self-paced. This therefore requires self-discipline and self-motivation. The problem sets need to be

turned in on time. It is the responsibility of the student to notify the instructor of technical and/or personal problems that may interfere with online participation. All students must check their Nicholls email account regularly. E-mail will be our primary means of communication. Just like a typical class, instances of academic dishonesty, such as plagiarism, will not be tolerated.

Course Outline
Introduction

I The Origins of the Problem
- A. Pierre Fermat
- B. Diophantus

II Special Cases
- A. n=4
- B. n=3
- C. Problems Generalizing

III The 20th Century
- A. Elliptic Curves
- B. Modular Forms
- C. Taniyama/Shimura
- D. Andrew Wiles

Course Objectives: At the completion of the semester, a student will be able to:
- List the important mathematicians involved with Fermat's Last Theorem
- Describe the progression towards the eventual proof
- State people, dates, and places of important developments
- Solve Diophantine equations
- Analyze early "proofs" of Fermat's Last Theorem for errors
- Describe the solutions to elliptic curves
- Categorize modular forms

Grading Policy: Your course grade will be composed of a problem set grade (50%), an "in-class" midterm exam grade (25%), and a take-home final exam grade (25%). The midterm exam will obviously not actually be in-class, since we do not have class. What I mean is that it will be a typical timed exam that students will take at a specified time and place (as opposed to a take-home exam that you can complete when and where you want during the time you are working on it). ***Distance education students need to choose an approved testing center in their local area and complete a Distance Learning Test Administration Approval Form (soon to be located under "Course Documents") prior to taking the exam. Once the form has been uploaded, I will give you two weeks to inform me of your choice. That will allow me ample time to contact your designated proctor and approve (or not) the selection.***

Academic Grievances: The proper procedure for filing grade appeals or grievances related to academic matters is listed in Section 5 of the *Code of Student Conduct* and at the following link: www.nicholls.edu/documents/student_life/code_of_conduct.pdf.

Continued Learning following an Extreme Emergency: In order to make continued learning possible following an extreme emergency

students are responsible for:

- reading regular emergency notifications on the NSU website;
- knowing how to use and access Blackboard (or university designated electronic delivery system);
- being familiar with emergency guidelines;
- evacuating textbooks and other course materials;
- knowing their Blackboard (or designated system) student login and password;
- contacting faculty regarding their intentions for completing the course.

faculty are responsible for:

- their development in the use of the Blackboard (or designated) software;
- having a plan for continuing their courses using only Blackboard and email;
- continuing their course in whatever way suits the completion of the course best, and being creative in the continuation of these courses;
- making adjustments or compensations to a student's progress in special programs with labs, clinical sequences or the like only in the immediate semester following the emergency.

Disability: If you have a documented disability that requires assistance, you will need to register with the Office of Disability Services for coordination of your academic accommodations. The Office of Disability Services is located in Peltier Hall, Room 100-A. The phone number is (985) 448-4430 (TDD 449-7002).