Instructor: Dr. Ron Hartberger  
Office Hours: See EXCEL file of my schedule on BB
Office: 206 – Math/ Comp Sci/ Engr  
Email: hartber@stthom.edu  
Phone: 713/525-3865

Course Description
Methods of proof (direct, contradiction, conditional, contraposition); valid and invalid arguments. Examples from set theory. Quantified statements and their arguments. Functions, indexed sets, set functions. Proofs in number theory, algebra, geometry and analysis. Proofs by induction. Equivalence and well-defined operations and functions. The axiomatic method. Prerequisites: MATH 1432

Text

This text is required. You cannot succeed in this course without a copy of the text. It is not expensive, and can be obtained from your favorite bookseller.

Learning Objectives
Upon completion of this course students should
- Know how to form well-formed mathematical statements.
- apply direct, contrapositive, contradiction methods to simple proofs.
- apply mathematical induction, existence and uniqueness proofs.
- determine what type of proof method is needed for examples drawn from different areas of study in Mathematics.
- be able to construct complete well-organized proofs suitable for publication in mathematical literature.
Learning Outcomes
Upon completion of this course, students should be able to:

- be able to distinguish *Hypothesis* and *Conclusion* in a statement.
- be able to write well-formed statements
- be able to apply direct methods to construct proofs
- be able to apply contrapositive methods to construct proofs
- be able to apply contradiction methods to construct proofs
- be able to determine necessary and sufficient conditions in an equivalence statement.
- be able to prove an equivalence statement
- be able to construct proofs using mathematical induction.
- be able to construct existence proofs.
- be able to construct uniqueness proofs.
- Be familiar with examples from Set Theory, Relations, Functions and Limits.

Grading
There will be regular homework assignments. These will generally be a direct application of material presented in class. Most homework problems will be constructing proofs. In addition to learning proof techniques, we are learning to present our thoughts and work in a well-designed and professional format. NEATNESS COUNTS!

Homework assignments will be graded on a 5 point scale. Three points for correctness and two points for form and neatness. Specifically:

Correctness:
- +3 The proofs used the correct technique and the technique was applied correctly
- +2 The correct technique was applied, but there were errors or incompleteness in application
- +1 An honest effort was made, but the results were unsatisfactory.

Form and Neatness:
- One point for proper form
- One point for overall neatness and presentability, (Subjective judgment)

These are learning experiences. If you are having trouble, then see me. I will help you with the material. You must individually hand in the work yourself.
To facilitate my grading of the assignments they are to be handed in on paper on the date they are due. **No late work.** You may use pen/pencil and paper, or some electronic math formatting tool. If you use electronic formatting, I will accept only printouts, not the computer code you used in the electronic formatting tool. I recommend that you try one of these tools early on. I suspect you will find it very satisfying to electronically format your work, and equation editing tools are relatively easy to use.

There will be three or four exams during the term. If you know you will need to miss an exam, see me ahead of time. Missed exams without my prior knowledge will result in a grade of zero. There will be a comprehensive final exam at the end of the course.

*To make-up any exam missed for illness, you must present a signed note from a physician stating that you were not able to take the exam.*

**Grading scale:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Participation</td>
<td>15%</td>
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<tr>
<td>Homework</td>
<td>5%</td>
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<tr>
<td>Exams</td>
<td>55%</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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93-100 A  
90-92.9 A-  
87-89.9 B+  
83-86.9 B  
80-82.9 B-  
77-79.9 C+  
73-76.9 C  
70-72.9 C-  
67-69.9 D+  
60-66.9 D  
<60 F

**Electronics Use Policy:**

You should already have discovered that it is **impossible to take notes of a mathematical nature on a laptop.** The use of laptops will **not** be permitted in this class nor will smartphones and other electronic devices.
If you have a personal situation which requires you always to be available to those who depend on you, please set any phone to silent ring mode and if a call comes in leave the classroom until your necessary conversation is completed. No texting, etc., will be allowed.

Audio or visual recording of class materials by electronic means will NOT be permitted. However special accommodations may be made for those students who have special documented needs, as certified by the University.

**Student Accommodations**

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, the instructor will make all possible and reasonable adjustments in policies, practices, services, and facilities to ensure equal and optimal educational programs and activities. Whenever a special accommodation is necessary to ensure access to full participation by a student with disabilities, that student must personally inform the instructor of any disability or needed accommodations.

The University Office for ADA Compliance may ask to seek proof of disability and specify accommodations as requested by students. Students with special needs should inform the instructor within the first two weeks of class. Students must also contact the Office of Counseling and Disability Services (2nd floor of Crooker Center) by calling Dr. Rose Signorello at 713-525-3162 or Ms. Debbie Jones at 713-525-6953.

The accommodations will become accessible only when the instructor receives official, written notification from the officer in charge of ADA compliance. Students should contact the instructor immediately if new needs arise. Students can see the instructor before or after class or request another time to discuss any matters. All information will be kept confidential.

**Academic integrity**

UST Students should demonstrate integrity in all of their activities, both personal and professional. Any unprofessional behavior or failure to adhere to the honor system is a serious violation of integrity and may result in failure of the course.

**Plagiarism** involves taking credit for another person’s work. Students must cite sources any time source material (e.g., books, journal articles, internet material, etc.) has been used, paraphrased, or quoted. Quoted material must be placed in quotation marks and referenced appropriately. Please note that copying information directly from a source without giving credit, using friends’ work, buying papers online, re-using one’s own work from previous classes, etc., all constitute plagiarism.
Any instance of plagiarism will result in a failing grade in the course and may result in dismissal from UST. Ignorance is no excuse; if a student remains uncertain about the guidelines for using and citing source material after these issues are addressed in class, the student should seek input from the instructor.