SUFFOLK COUNTY COMMUNITY COLLEGE

COURSE OUTLINE
Spring 2009

COURSE
MAT101 - A Survey of Mathematical Reasoning

COURSE NUMBER
24055

PREREQUISITE
MAT007 or equivalent

INSTRUCTOR
Dr. Jean Nicolas Pestieau

OFFICE
Shinnecock 223

CONTACT
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WEBSITE
http://www2.sunysuffolk.edu/pestiej

OFFICE HOURS
Monday 4:00 p.m. – 5:00 p.m. (online),
Tuesday 12:00 p.m. – 3:00 p.m.,
Thursday 3:00 p.m. – 4:00 p.m. , or by appointment.

COURSE CATALOGUE DESCRIPTION
Liberal arts mathematics course which provides insight into the nature of mathematical reasoning by examining basic structures such as logic, sets, real numbers, numeration systems and inductive reasoning.

COURSE GOALS
A. Expose students to the foundations of mathematical methods.
B. Introduce inductive and deductive reasoning.

COURSE OBJECTIVES
Upon successful completion of this course, students will be able to:
A. Distinguish between deductive and inductive reasoning and be able to apply each in problem solving.
B. Make connections between mathematical discoveries and the history of human thought.
C. Perform the basic operations of set theory including: intersection, union and complement.
D. Analyze basic data-type questions (survey results) using subsets and Venn diagrams.
E. Translate verbal statements into symbolic forms of implication, conjunction, disjunction and bi-conditional.
F. Test for the validity of arguments using various methods.
G. Define logical connectives using truth tables and be able to discover tautologies and prove theorems using truth tables.
I. Distinguish between rational and irrational numbers using the infinite decimal concept.
**REQUIREMENTS**
The student is responsible for all material taught or assigned by the instructor, as well as for any announcements made by the instructor in class. Should he/she miss a class, it is his/her responsibility to obtain any missed assignments from a classmate or from the instructor.

Students are required to behave in accordance with the student code of conduct as outlined in the student handbook. An atmosphere of mutual respect will be maintained at all times in the classroom. Any student who is disruptive or violates proper classroom decorum will be asked to leave.

**Four exams and a cumulative final exam will be given. In addition, homework problems will be assigned after each lecture, but not collected.**
The instructor may choose to make any of the four exams a take-home graded assignment.

**The use of a calculator will not be necessary for this course, but a student is permitted to use one should he/she wish to do so.**

In order to pass this course, the student must demonstrate a reasonable understanding of the subject topics. He/she should then be capable of performing the course objectives cited above. An overall assessment of the student will be made based on his/her class participation and, more importantly, on his/her performance on the written exams. Final student grades will be decided based on the median class performance (roughly corresponding to a C+ grade) and a reasonable class grade distribution.

The student is responsible to follow registrar procedure for withdrawal. Students who neglect to do so and stop attending the course will receive a grade of F. Exceptions will be made only for extenuating circumstances and at the discretion of the instructor.

**ATTENDANCE POLICY**
All students are expected to attend every class. Students are responsible for all that transpires in class, whether or not they are in attendance.

An attendance sheet may be passed around during lecture, for all students to sign, in order to keep an updated class roster. It is important and, frankly, in your best interest that you come to class regularly and sign this sheet. I expect students to be present for each class, or to notice me of their absence should they have a valid reason to skip class.

**GRADING PROCEDURES**
The lowest exam grade, not including the final exam, will be dropped.

Students are strongly encouraged to view all the corrected exams posted on the course website.

Homework problems will be assigned throughout the semester. While these will not be collected, all students should try doing these problems at home and, subsequently, ask questions about them at the start of each class or, eventually, outside class during office hours.

It is the student’s responsibility to come to each of the exams, or notify me of their absence in due time should they have a valid reason to miss one. If an exam absence can be justified, arrangements with the student will be made.

The final grade will be determined according to the following formula:

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\begin{align*}
70\% & \text{ exams} \\
30\% & \text{ final exam}
\end{align*}
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**REQUIRED TEXTBOOK**
Mathematical Excursions, 2nd Edition
Aufmann, Lockwood, Nation and Clegg
Houghton Mifflin

**SUPPORTING INFORMATION**
Free tutoring and use of computer software is available at the Academic Skills Center, in Orient 213.
OUTLINE OF TOPICS

[All exam dates are tentative]

Set Theory [Chapter 2 in book]

1. Basic Definitions, Symbols and Terminology
2. Subsets and Venn Diagrams; the Power Set
3. Set Operations: the Complement of a Set, the Union, Intersection and Difference of Two Sets; Equality Between Sets; De Morgan’s Laws
4. The Inclusion-Exclusion Principle; Survey Problems
5. Infinite Sets: Cantor’s Cardinality Results, Transfinite Cardinals and Their Arithmetic, Russell’s Paradox, the Continuum Hypothesis

Exam 1 [03/19]

Logic [Chapter 3 in book]

1. Logical Statements, Quantifiers, Logical Connectives and Their Symbolic Notation
2. Truth Tables; Equivalence in Symbolic Logic; De Morgan’s Laws Revisited; Tautologies and Self-Contradictions
3. The Conditional and the Biconditional

Exam 2 [04/16]

4. Equivalent and Related Forms of the Conditional
5. General Arguments: Analysis via Truth Tables and Standard Forms
6. Arguments with Quantifiers: Analysis via Euler Diagrams
7. Switching Circuits [Excursion From Section 3.1 in Book]

Exam 3 [05/05]

Real Numbers

1. Classification of Real Numbers Into Sets: Naturals, Integers, Rationals and Irrationals
2. Decimal Representation of Real Numbers
3. Going Beyond the Reals: Complex Numbers

The Principle of Mathematical Induction

1. An Overview of the Principle of Mathematical Induction
2. Proofs by Mathematical Induction for Infinite Sums and for Properties of the Fibonacci Sequence

Take-Home Exam 4 [due 05/14]

Final Exam [05/14]