

VIRGINIA STATE UNIVERSITY  
SCHOOL OF AGRICULTURE, SCIENCE AND TECHNOLOGY  
DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE  
MATH 290 - FOUNDATION OF MATHEMATICS - 3 Semester Hours  
COURSE SYLLABUS SPRING 2004

PROFESSOR'S NAME: **Dr. G. L. Burton**

OFFICE HOURS: Monday  
Tuesday  
Wednesday  
Thursday  
Friday

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**Course Description:**

A study of the development of mathematical concepts and of the great mathematicians who introduced these concepts; development of integral and differential calculus, development of concepts in modern algebra, and the use of rigorous set theory as the foundation for analysis, algebra, and topology.

University regulations may be found in the Student Handbook.

**Prerequisite:** MATH 200 or concurrent with MATH 201.

**Textbook:**

Each student MUST purchase the following textbook: Bernard, Kenneth and Wellenzohn. FOUNDATIONS OF MATHEMATICS. Clearwater, Florida: H & H Publishing. 1997.

**Calculator:**

MATH 290 is NOT calculator-based, however the TI-83 calculators required for previous courses (MATH 120, MATH 121 and MATH 200) will satisfy any calculator activities.

**KNOWLEDGE, SKILLS, and ABILITIES (KSAs)**

**Knowledge:**

Upon successful completion of the course students will:

Identify some of the individuals responsible for the development of mathematics as well as their accomplishments in the history of mathematics

Differentiate between inductive and deductive reasoning

Identify the properties of real numbers; i.e., the field axioms

Know terminology related to sets

Know terminology related to mathematical logic

Know well-ordering, closed sets, compact sets, bounded sets and other terminology related to higher-level mathematical concepts

Identify mathematical notations and symbols

Differentiate between between the various areas of mathematics

**Evaluation strategies: All knowledge criteria will be evaluated by tests, essays, quizzes, and home assignments.**

**Skills:**

Upon successful completion of the course students will:

Solve problems involving set theory

Use mathematical logic to draw conclusions

Use the field axioms and equivalence relations to explain mathematical results

Present the correct steps to direct proof, proof by contrapositive, proof by contradiction, proof by exhaustion, and mathematical induction

Present reports on articles from The College Journal of Mathematics and The Mathematics Teacher

Explain the basic concepts of linear algebra, modern algebra, analysis, probability, statistics, modern geometry, and topology

**Evaluation strategies: All skill criteria will be evaluated by tests, essays, quizzes, oral presentations, in-class activities, and home assignments.**

**Abilities:**

Upon successful completion of the course students will:

Show proficiency in deductive reasoning and mathematical problem solving

Write mathematical proofs of important theorems in various subject areas

Compose a written paper on assigned mathematical topics using references

**Evaluation strategies: Ability criteria for the preceding objectives will be measured by tests, in-class activities, and oral presentations, panel discussions, compiling internet information, library research, and teaching lessons to the class.**

**Course Activities and Requirements:**

The number of class hours for each topic is approximate and flexible. These hours include teaching, review and testing time. At the discretion of the professor, each student **may** be REQUIRED to write in-class **essay** assignments and to type out-of-class **library research** assignments as graded activities. The grading procedure and weight of the grades of the writing assignments will be determined by the professor. Some of the possible topics that may be assigned are listed below. Each report must include a bibliography of **at least five references with no more than two internet sources**. The length of the assignments varies but 3-4 **typed pages** (required double-spaced and 12-pt font size) is recommended. All work should be paraphrased in your own words and not plagiarized from references. Sketches, photos, graphs, and diagrams are encouraged and can enhance your grade but do not count toward the length requirement.

**SAMPLE INDIVIDUAL LIBRARY RESEARCH TOPICS**

1. Pythagoras and the Pythagorean Theorem
2. Euclid and Euclidean Geometry
3.  $\pi$  (Pi): It's History and Importance
4. Trigonometry
5. The History of Algebra
6. Sequences: Arithmetic, Geometric, and Fibonacci
7. Isaac Newton and Gottfried Leibniz and the Development of Calculus
8. Probability and its Uses
9. Sets and Set Theory
10. Statistics and its Uses
11. Logic (Symbolic or Mathematical)
12. Properties and Theorems of Triangles
13. The History of Computers
14. George Polya and Problem-solving
15. The Golden Ratio and Golden Rectangles
16. Special Numbers: Prime, Perfect, Triangular, Amicable or Friendly, Rational vs Irrational, Transcendental and

- the Properties of Real Numbers
17. Women in Mathematics
  18. Non-Euclidean Geometry
  19. Rene Descartes and Blaise Pascal
  20. Permutation, and Combination
  21. African Americans in Mathematics
  22. Transformations and Symmetry: Rotation, Translation, Reflection, Contraction, and Dilation
  23. Book report - Any book or article by Martin Gardner
  24. Book report - Any book by John Allen Paulos
  25. Complex Numbers
  26. Fermat's Last Theorem
  27. Joseph LaGrange, Leonhard Euler, Karl Gauss, and Georg Cantor
  28. Jakob and Johann Bernoulli, George Boole, and George Riemann
  29. Stephen Jobs, Bill Gates, Charles Babbage, and John Napier
  30. Elementary Number Theory

NOTE: Any historical paper involving individuals should include his/her contribution to mathematics as well as personal information about that individual.

**Grading Standards:**

Each student's grade will be determined by the following criteria:

1. Grading Scale

A: 90-100 B: 80-89 C: 70-79 D: 60-69 F: below 60

2. Midterm Grade

The midterm examination will comprise 1/3 of the midterm grade. The average of all other work required by the professor (including tests, quizzes, home assignments, essays, and research papers) determines the other 2/3.

3. Final Grade

The midterm average will be weighted as 40%. The average of all work after midterm (including tests, quizzes, home assignments, essays, and research papers) will be weighted as 40%. The final examination will make up the other 20%.

**Attendance:**

Attendance is mandatory. For all students, regardless of classification, absence (including excused absence) does not relieve you of completing or making up all missed assignments. It is your responsibility (not the professor=s) to make certain that you have made up all required academic content.

**Bibliography:**

The following books are recommended references for use

at various times throughout the course. Professors **may** assign readings from these or other books for book reports as required or for extra credit.

Bridge to Abstract Mathematics, Ronald Morash (New York: McGraw-Hill, 1991)  
The Structure of Proof with Logic and Set Theory. O'Leary, Michael. Upper Saddle River, New Jersey: Prentice Hall, Inc. 2002  
Overcoming Math Anxiety, Sheila Tobias (Boston: Houghton-Mifflin Company, 1978)  
How to Solve It, George Polya (New Jersey: Princeton University Press, 1973)  
Mathematical Recreations and Essays, W.W.R. Ball and H.S.M. Coxeter (New York: McMillan, 1962)  
Innumeracy, John Allen Paulos (New York: Hill and Wang, 1988)  
The Mathematical Experience, Phillip Davis and Reuben Hersh (Boston: Houghton Mifflin Company, 1981)  
On the Shoulders of Giants: New Approaches to Numeracy, Lynn Authur Steen, Editor (Washington, D.C.: National Academy Press, 1990)  
A Transition to Advanced Mathematics, 5<sup>th</sup> ed. Douglas Smith (Pacific Grove, California: Brooks/Cole, 2001)

**Final Examination:**

**The final examination is cumulative of the entire course and MUST be administered in accordance with the VSU final examination schedule. Any exceptions must be approved by the Chair of the Mathematics Department.**

----- Maximum time - 2 Hours

Students who are covered under the American Disability Act should privately inform the teacher of this fact so that appropriate instructional arrangements can be made.

All comments and suggestions should be sent in writing to **Dr. G. L. Burton, P.O. Box 9068, VSU.**