Departmental Course Syllabus—MAT 102: Mathematics for the Liberal Arts

I. Basic Course Information

A. Purpose Statement**:** MAT 102: Mathematics for the Liberal Arts is intended to expose students to the methods of mathematical thought, and to some topics in pure mathematics.

B. Course description: A liberal studies course covering topics in pure mathematics. Topics are chose by the individual instructor from a list including Logic, Infinite Sets, Combinatorial Probability, Mathematical Systems, and Number Theory.

C. Course prerequisites: none.

II. Learning Goals

A. Content goals: Topics to be chosen by the instructor from the attached list.

B. Performance goals: At the completion of the course, students should show competence with the ideas and calculations of the topics of the course, and should exhibit an improved ability to approach and solve a real-world problem mathematically.

III Student assessment

A syllabus should clearly describe the schedule for the assessment tools, the criteria that will be used to evaluate student performance, and how the grades will be calculated. The assessment should be linked directly to the learning goals. Feedback must be timely and constructive. Assessment methods that could be used at the instructor's discretion include homework, quizzes, student presentations, and examinations.

IV Learning activities

A. Summary of learning activities: Learning activities will consist of a combination of lectures, homework sets, independent reading, group work, and student presentations. The specific choice will depend upon the individual instructor. Students are expected to do a significant amount of work outside of class.

B. Calendar or outline: A guide to the organization of the course, a schedule of assessment tools, and a plan for the coverage of topics should be provided to the students.

Recommended Topics List

The individual instructor is to choose from among the listed topics. Any topic chosen should be developed to a depth well beyond what students would likely have seen in high school

A. Logic

1. Axioms
2. Tautologies
3. Valid Arguments
4. Proofs

5. Counterexamples
6. Predicates and Quantifiers

B. Infinite Sets

1. Set operations and number sets
2. Venn Diagrams and the relation to logic
3. Infinite Sets
4. Cardinal numbers
5. Countability of the Rational numbers
6. Uncountability of the Real Numbers
7. The Continuum hypothesis (historical discussion)

C. Parallel and Series Circuits

1. The connection between logic, sets, and electrical circuits

D. Combinatorial Probability

1. Sample spaces
2. Events
3. Probability measure
4. Conditional probability
5. Counting Techniques
6. Independence
7. Binomial Probability
8. Stochastic processes
9. The Law of Large Numbers

E. Mathematical Systems

1. Groups
2. Permutation groups
3. Transformation groups of the triangle, square, rectangle,…
4. Rings
5. Elementary theorems in the systems
6. Group and ring isomorphisms

F. Number Theory

1. Divisibility
2. Primes and factorization
3. Pythagorean triples
4. Linear Diophantine equations
5. Continued fractions
6. Fermat's last theorem (historical discussion)