Departmental Course Syllabus—MAT 101: Applied Liberal Arts Mathematics

I. Basic Course Information

A. Purpose Statement**:** MAT 101: Applied Liberal Arts Mathematics is intended to expose students to the methods of mathematical thought, and to some modern applications of mathematics.

B. Course description: A liberal studies course covering applied topics in modern mathematics. Topics are chose by the individual instructor from a list including graph theory, coding, voting and social choice, and game 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. Some possible choices are listed below.

A. Graph Theory

1. Euler circuits
2. Hamiltonian Circuits
3. Traveling Salesman problems
4. Minimal Cost spanning trees
5. Critical-path analysis

6. Scheduling tasks
7. Critical –path schedules
8. Independent tasks
9. Bin packing
10. Resolving Conflict

B. Coding
1. Check digits
2. ZIP codes
3. Bar codes

C. Voting
1. Elections with 2 alternatives
2. Elections with 3 or more alternatives
3. Paradox of Condorcet
4. Approval voting
5. Weighted voting
6. Banzhaf Power index
7. Equivalent voting systems
8. Shapley-Shubik Power index

D. Fair Division
1. Adjusted Winner procedure
2. Knaster inheritance procedure
3. Taking turns
4. Divide and choose
5. Cake-division procedures

E.. Apportionment
1. Hamilton method
2. Divisor methods

E. Game Theory
1. Two-person Total Conflict games: pure strategies
2. Two-person Total Conflict games: mixed strategies
3. Partial Conflict games
4. Larger games

Possible choices of topics:
Graph theory and Voting
Graph theory and Game theory
Voting, Fair Division, and Apportionment
Fair Division, Apportionment, and Game theory

Remarks: Different topics work for different teachers. It is worth taking some time deciding what to cover. The perennial problem with the course is that we cannot find

a book with enough challenging material. It is always recommended that the instructor supplement the text with some material from other sources. "Coding" is interesting but might be mathematically light.