Southern Connecticut State University
MAT 140–Computational Tools for Mathematics and the Sciences

I. Description

(A) **Catalog Description**: Introduction to computer software as it may be used in the mathematical and scientific disciplines. Includes but is not limited to uses of spreadsheets, computer algebra, interactive geometry, vector graphics, and document preparation.

(B) **Expanded Description**: Students will solve a large number and variety of routine and exploratory problems related to mathematics and the sciences using appropriate computer software. The mantra "use the right tool for the job" will echo throughout the course. While it is desirable that each student will learn some mathematics from the explorations, the focus will be on how and when to use the various computational tools. While most of the problems will be motivated by the desire to answer a practical question, certain questions will be motivated solely out of mathematical curiosity. Questions will be drawn from algebra, statistics, geometry, numerical methods, discrete math, and related applications.

II. Credit

(A) MAT 140 carries three (3) semester hours of college credit.

(B) MAT 140 is required of all mathematics majors.[1]

(C) MAT 140 satisfies the Tier I technological fluency requirements.[2]

III. Prerequisite

The prerequisite is one of MAT 100, MAT 102, or placement beyond these courses. Specifically, competency in high school algebra is required.

IV. Format

(A) MAT 140 is a hands-on course that will be equal parts lecture and laboratory exploration.

(B) A laptop computer is recommended.

V. Outline

The specific competencies that will be discussed are

(A) Document Preparation (throughout the course, but concentrated during a contiguous 10% of the course)

1. Typesetting mathematics
2. Format and structure of memoranda, reports, classroom materials, journal articles, presentations, etc. that include mathematical content
3. Produce and edit graphical content appropriate for inclusion in a mathematical document

(B) Spreadsheets (25%)

1. Visualizing data sets
2. Basic statistical computations and their meanings
3. Exploration of applied discrete mathematical systems such as consumer loans and population dynamics

(C) Interactive Geometry (20%)

[1] Pending Departmental approval.
[2] Pending Departmental and UCF approval.

1. Geometric constructions
2. Theorem discovery through interaction and analysis

(D) Symbolic computer algebra (25%)

1. Exact computation
2. Simplifying algebraic expressions
3. Solving equations
4. Graphing functions of one variable
5. Solving word problems by synthesizing the skills above

(E) Vector graphics (20%)

1. Creating graphs of functions
2. Creating diagrams
3. Exporting from a drawing program
4. Importing into a report or other document

VI. Goals

(A) Communicate effectively, and explain mathematics both verbally and in writing.

(B) Demonstrate the ability to use and understand multiple representations (including graphical, numerical and analytical) of mathematical concepts.

(C) Understand and appreciate connections among different areas of mathematics and with other disciplines.

(D) Utilize appropriate technology to develop models for solving problems and analyzing new situations.

(E) Create vector graphics of functions and other figures.

VII. Outcomes

Students passing MAT 140 should be able to do each of the following tasks.

(A) Determine which computational tool is the most appropriate to use for a given task.

(B) Create histograms and boxplots, and calculate basic statistical measures using a spreadsheet.

(C) Complete basic algebraic manipulations using a computer algebra system.

(D) Write about mathematics using a mathematical typesetting engine.

(E) Understand the difference between raster and vector graphics, and when and how to use each.

(F) Create geometric constructions electronically.

(G) Use interactive geometry to discover geometric relationships.

(H) Demonstrate competency in production of graphics suitable for insertion into other documents.

VIII. Waiver Policy

There is no waiver policy for MAT 140.

IX. Preparation and Approval

Prepared on 28 April 2015.

Approved by the MDCC on .

Approved by the department on .

X. Preparers

Prepared by Leon Brin and Joseph Fields.