MAT 162 Model Syllabus

Quantitative Reasoning

(Approved March 2016)

(Updated by the Mathematics Interest Group January 2013)

Course Catalog Description: MAT 161-162. Calculus with Analytic Geometry (4-4)
Prerequisite: MAT 112 or 115 or equivalent preparation in algebra and trigonometry. Calculus of a single variable intended for students in the mathematical and natural sciences. Functions and limits; differentiation with applications including maxima and minima, related rates, approximations; theory of integration with applications; transcendental functions; infinite sequences and series; conic sections, parametrized curves and polar coordinates; elementary differential equations. Three lecture and two hour laboratory hours each week.

Goal of the Course: MAT 162 is the second half of the standard university single variable calculus sequence. Its principal goal is to show how calculus has served as the primary quantitative language of science and engineering for the last three centuries by providing the theoretical basis used to measure change. Students will further investigate the processes of differentiation and integration introduced in MAT 161 in addition to the topics of differential and parametric equations and infinite sequences and series. Students will study the wider application of these skills in the natural and social sciences and communicate the results of these investigations.

MAT 162 will count for the Quantitative and Logical Reasoning requirement by supporting all the Common Student Learning Outcomes (QRE) for Quantitative and Logical Reasoning.

Course Student Learning Objectives: Upon completing MAT 162, students should be able to:

- Use graphical, numerical, analytical and verbal representations of integrals, differential and parametric equations, sequences and infinite series. (QRE 1)
- Use techniques of integration and differential equations to solve problems involving two or more STEM disciplines. (QRE 1 & 2)
- Use calculus to understand the properties of conic sections and other curves in polar and parametric form. (QRE 1)
- Understand convergence properties of sequences and series. (QRE 1 & 2)
- Use correct mathematical syntax to explain solutions in both written and graphic forms. (QRE 3)
- Model real-world problems using the concepts of calculus. (QRE 2 & 3)
- Use technology to help solve problems, experiment, interpret results, and verify and communicate conclusions. (QRE 1 & 2)
- Determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement. (QRE 1, 2 & 3)

Approved Text and Course Outline: MAT 162. Calculus with Analytic Geometry II

Required Text: *Calculus: Early Transcendentals*, 7th edition, by Stewart

Chapter	Topic/Title	Sections	Suggested Number of Lectures
	Review of Trig., Differentiation and Integration		5
7	Techniques of Integration	1-8	15
8	Further Applications of Integration	1-3	7
9	Differential Equations	1-5	5
17	Second-order Differential Equations	1	2
10	Parametric Equations and Polar Coordinates	1-6	13
11	Infinite Sequences and Series	1-10	15

Except as specifically noted, all of the topics in the sections listed must be covered. This syllabus is designed for a course that has 70 50-minute class meetings. The suggested number of lectures per chapter includes lectures and labs but does not include review days and testing.

Required Technology in MAT 162: MAPLE is the principal mathematical software used in MAT 162. The departmentally approved and required minimal expectations for computer use in MAT 162 are: function approximation, convergence, parametric equations, and polar equations. The theme of graphing and graphical analysis is to be continued, and clearly there are other topics that benefit from technology as well, including: direction fields for differential equations, Euler's Method, obtaining error estimates for the trapezoidal rule and Simpson's Rule, obtaining error estimates for series approximations, and graphing position functions for oscillation problems. The text identifies by a special icon those exercises that require some form of technology. Exercises that require the full power of a computer algebra system are identified in the text by a CAS icon. Students will utilize this technology in classroom exercises in BR 161 and other lab assignments to be completed outside of class.