Applied Calculus with Quantitative Methods

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Course number: QTM1300

Meeting location: Gerber 102

Office hours: M 1:30pm – 3:00pm, R 1:00pm – 3:00pm, or by appointment

Required Materials

Applications of Quantitative Methods and Calculus (Custom Edition for Babson College), Warner and Constable.

Other relevant references and assignments may be distributed through Blackboard .

Course Description

From the course catalog:

The Regular sections of QTM1300 are designed for those students who had no high school calculus course. These students also must have a passing score on the Mathematics Skills Test. The course covers the necessary core quantitative methods subject matter that is prerequisite to follow-on courses in QTM and in Babson's integrated core business offerings. Technology and the use of spreadsheets are integrated throughout so that students better comprehend the importance of using modern technological tools for model building and decision making. Prerequisites: NONE

General Course Policies

A detailed discussion of course components is found below, but there are recurring themes:

- Conduct yourself professionally
- Be an active participant in your education
- Produce quality work

These are overlapping and mutually reinforcing principles. They imply, for instance, that you should attend class regularly, that you should start an assignment well before its due date, that you shouldn't text or surf the internet during class, along with many others.

Honor Code

By submitting any assignment for evaluation, you implicitly agree with the following statement:

I have neither given nor received unauthorized assistance on this assignment.

It is your responsibility as a member of the Babson community to understand the nature and implications of the Honor Code. Further information pertaining to Babson's Honor Code can be found in the undergraduate handbook.

Disabilities

Any student who feels he or she may need an accommodation based on the impact of a disability should contact me privately and in a timely fashion to discuss his or her specific needs. Students must also contact the Manager of Disability Services at 781-239-4508 or in Hollister Hall to coordinate reasonable academic accommodations.

Religious Observances

Any student who faces a conflict between the requirements of this course and the observance of his or her religious faith should contact me as early in the semester as possible. In such an event, I will provide reasonable accommodations that do not unduly disadvantage the student.

Specific Course Policies

Evaluation

The breakdown of the final grade will be as follows

Reading checks	10%
Homework	10%
Quizzes	15%
Midterm 1	15%
Midterm 2	20%
Final	30%

Reading checks will be performed daily in the first 5 minutes of class through Blackboard. Homework will be collected weekly on Mondays at the beginning of class. Quizzes will be in-class, timed exercises. Both midterms and the final exam will be take-home with an oral exam component.

Late and Makeup Policy

Late homework or makeup exam only will be accepted in extreme circumstances (e.g., a death in your immediate family). If you know that you have a conflict on a particular due date, it is your responsibility

to contact me as early as possible so we can determine an appropriate solution. Note that, for instance, booking a plane ticket to leave before the official start of vacation is not a reason to miss a quiz or exam.

Tentative Schedule

Date	Topic	Pre-class reading
23 Jan.	Introduction	
28 Jan.	Functions and models	1.1, 1.2
30 Jan.	Linear models	1.3
4 Feb.	Linear regression	1.4
6 Feb.	Systems of inequalities	2.1, 4.1
11 Feb.	**Quiz**, Graphical linear programming	4.2
13 Feb.	Linear programming with Solver	Handout
19 Feb.	Quadratic and exponential models	9.1, 9.2
20 Feb.	Quiz, Average rate of change	10.4, 10.5
25 Feb.	Derivatives of common functions	10.6, 11.1
27 Feb.	Midterm 1	
4 Mar.	Marginal analysis	11.2
6 Mar.	Product, quotient and chain rules	11.3, 11.4
11 Mar.	**Quiz**, Derivatives logarithms and exponentials	11.5
13 Mar.	Second derivatives	12.1, 12.3, 12.4
18 Mar	Spring Break	
20 Mar	Spring Break	
25 Mar.	Nonlinear optimization	12.2
27 Mar.	Nonlinear optimization	12.2
1 Apr.	Indefinite integration	13.1
3 Apr.	**Quiz**, Definite integration	13.4, 14.2
8 Apr.	Simple interest	5.1
10 Apr.	Midterm 2	
15 Apr.	Patriot's Day	
17 Apr.	Compound interest	5.2
22 Apr.	Annuities and sinking funds	5.3
24 Apr.	Loans and bonds	5.3
29 Apr.	Additional finance topics	TBD
1 May	**Quiz**, Review	

Course Objectives

The course can be roughly broken into 5 distinct but related modules, each with its own objectives.

Module 1: Linear models

- Articulate the importance and uses of linear models in common applications
- Compute the slope and y-intercept of a linear model given two or more consistent data points

- Interpret the units of slope and y-intercept in the context of a given linear model
- Use a linear model to interpolate and/or extrapolate, and understand the limitations of these methods
- Compute and interpret the sum of squared errors for one or more linear models
- Understand the significance of the line of best fit with respect to the sum of squared errors metric

Module 2: Linear optimization

- Visualize linear inequalities as regions in space
- Solve systems of linear equations
- Articulate understand how the simplex method finds a solution to a bounded LP problem
- Use the simplex method to graphically solve two-dimensional LP problems
- Use Solver to computationally solve high dimensional LP problems

Module 3: Derivatives

- Qualitatively understanding the meaning of the average rate of change between two points
- Compute and articulate the meaning of the units of average rate of change in a particular model
- Articulate the difference between average rate of change and instantaneous rate of change
- Use derivatives in the various models, e.g., marginal analysis
- Compute by hand the derivatives of polynomials
- Compute using any computational tool the derivatives of exponentials, polynomials, logarithms, and various combinations of these functions
- Compute higher order derivatives
- Interpret the second derivative as concavity, and use this interpretation in the context of modeling

Module 4: Nonlinear optimization and integration

- Identify all maxima and minima of a continuous function on a given interval
- Articulate the connections between concavity, second derivatives and maxima and minima
- Compute the antiderivative of a continuous function
- Use antiderivatives in various models, e.g., converting from marginal cost to total cost
- Understand definite integration of a continuous function as area under the curve
- Compute definite integrals using the fundamental theorem of calculus
- Use Riemann sums to approximate definite integrals
- Compute the area between two curves using the definite integral of their difference

Module 5: Finance

- Compute various quantities related to simple interest investments
- Compute various quantities related to compound interest investments
- Understand the qualitative and quantitative difference between simple and compound interest
- Compute various quantities related to retirement savings and other sinking funds

- Compute various quantities related to mortgages and other annuities
- Mathematically conceptualize investments from the points of view of both the lender and borrower