Request for BUS 250 - Applied Mathematics in Business - as a Continuing FS course

Kapi‘olani Community College, Fall 2013

Page  Contents
2     Course Description
3     Hallmark 1 Sample Materials
5     Hallmark 2 Sample Materials
6     Hallmark 3 Sample Materials
8     Hallmark 4 Sample Materials
9     Hallmark 5 Sample Materials
10    Hallmark 6 Sample Materials
11    Course Outline
29    Course Syllabus

Michael Paulding  
Business, Legal, and Technology Education Faculty  
mpauldin@hawaii.edu  
KapCC campus extension: x9308

Alfred J. Seita  
Business, Legal, and Technology Education Faculty  
alfreds@hawaii.edu  
KapCC campus extension: x9458
I Course Description (from Course Outline)

COURSE INFORMATION: 

BUS 250 Applied Mathematics in Business (3) KCC AA/FS and KCC AS/ML
3 hours lecture per week

Prerequisite(s): A grade of "C" or higher in MATH 103 or qualification for MATH 135.

Recommended preparation: ICS 100 or ICS 101; qualification for ENG 100 or ESL 100

BUS 250 covers the algebra and geometry of linear, quadratic, exponential, and logarithmic functions as applied to the mathematics of finance – annuities, perpetuities, present value and future value. BUS 250 also covers derivatives, indefinite integrals, graphical analysis, and mathematical models as applied to business, with selected coverage of algebra, geometry, and calculus emphasizing business applications and decision making.

COURSE OBJECTIVES/COMPETENCIES:

Upon successful completion of BUS 250, the student should be able to:

- Solve linear, quadratic, exponential, and logarithmic equations with applications to business, such as solving for interest rates and various terms of investment
- Calculate present and future values (PV and FV) of simple and compound interest
- Solve for PV, FV, payment, interest, and duration of ordinary/due simple annuities, sinking funds, and constant growth annuities
- Apply formulas for interest to solve problems involving installment buying and credit card purchases
- Apply formulas for interest to solve problems involving debt consolidation and rescheduling of debt
- Apply formulas for interest to solve problems involving government and corporate bonds
- Describe the various types of mortgage loans, construct amortization schedules, and calculate the various components of mortgage payments
- Apply amortization tables to calculate the various components of mortgage payments and refinancing options
- Master the use of financial calculators to formulate, analyze, and interpret mathematical models in business
- Describe the derivative of a function and apply rules for differentiation
- Apply derivatives in curve sketching with applications to business, as in solving for marginal revenue/cost, marginal tax rate, minimum cost, and maximum profit
- Describe the indefinite integral of a function, and apply rules for integration
II Assessing of Course. Below are examples of course materials that illustrate how the course meets the foundations hallmarks.

Hallmark 1. Exposed students to the beauty, power, clarity and precision of formal systems.

The breadth of material includes numerous topics of mathematics such topics as Functions, Logarithmic and Exponential Equations, Limits, Continuity, and the Derivative. The Business, Legal, and Technology (BLT) Education faculty will introduce real world business examples of these topics through lectures and/or group activities. The results of these lectures/activities will lead to the derivation and/or proofs of formulas that are used in solving applications of similar problems. In addition, the Business, Legal, and Technology Education faculty will assign quiz exercises and project activities which are specifically selected to show students the power and precision of formal systems. Through the above lecture/activities/assignments students are expose to the power, beauty, clarity, and precision of formal systems.

Below is sample material from (Lial, et al., 2011, Finite Mathematics and Calculus with Applications, 9th edition, Pearson, ISBN 0321749081, p.190-191) that a lecture/group activity would be based on to derive/prove (via mathematical induction) the formula for the compound interest formula.

**Compound Interest**  As mentioned earlier, simple interest is normally used for loans or investments of a year or less. For longer periods compound interest is used. With **compound interest**, interest is charged (or paid) on interest as well as on principal. For example, if $1000 is deposited at 5% interest for 1 year, at the end of the year the interest is $1000(0.05)(1) = $50. The balance in the account is $1000 + $50 = $1050. If this amount is left at 5% interest for another year, the interest is calculated on $1050 instead of the original $1000, so the amount in the account at the end of the second year is $1050 + $1050(0.05)(1) = $1102.50. Note that simple interest would produce a total amount of only

$$1000[1 + (0.05)(2)] = 1100.$$  

The additional $2.50 is the interest on $50 at 5% for one year.

To find a formula for compound interest, first suppose that $P$ dollars is deposited at a rate of interest $r$ per year. The amount on deposit at the end of the first year is found by the simple interest formula, with $t = 1$.

$$A = P(1 + r \cdot 1) = P(1 + r)$$

If the deposit earns compound interest, the interest earned during the second year is paid on the total amount on deposit at the end of the first year. Using the formula $A = P(1 + rt)$ again, with $P$ replaced by $P(1 + r)$ and $t = 1$, gives the total amount on deposit at the end of the second year.

$$A = [P(1 + r)](1 + r \cdot 1) = P(1 + r)^2$$

In the same way, the total amount on deposit at the end of the third year is

$$P(1 + r)^3.$$  

Generalizing, in $t$ years the total amount on deposit is

$$A = P(1 + r)^t,$$

called the **compound amount**.

**NOTE**  Compare this formula for compound interest with the formula for simple interest.

<table>
<thead>
<tr>
<th>Compound interest</th>
<th>Simple interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A = P(1 + rt)$</td>
<td>$A = P(1 + r)$</td>
</tr>
</tbody>
</table>

The important distinction between the two formulas is that in the compound interest formula, the number of years, $t$, is an **exponent**, so that money grows much more rapidly when interest is compounded.
Interest can be compounded more than once per year. Common compounding periods
include semiannually (two periods per year), quarterly (four periods per year), monthly
(twelve periods per year), or daily (usually 365 periods per year). The interest rate per
period, \( i \), is found by dividing the annual interest rate, \( r \), by the number of compounding
periods, \( m \), per year. To find the total number of compounding periods, \( n \), we multiply the
number of years, \( t \), by the number of compounding periods per year, \( m \). The following for-
mula can be derived in the same way as the previous formula.

\[
A = P(1 + i)^n
\]

where \( i = \frac{r}{m} \) and \( n = mt \).

- \( A \) is the future (maturity) value;
- \( P \) is the principal;
- \( r \) is the annual interest rate;
- \( m \) is the number of compounding periods per year;
- \( t \) is the number of years;
- \( n \) is the number of compounding periods;
- \( i \) is the interest rate per period.
Hallmark 2. Help students understand the concept of a proof as a chain of inferences.

Proofs which use a chain of inferences will be presented to help students understand why theorems/formulas have meaning or value in their direct use in solving problems. An example activity is to first derive the formula for sum of terms in a Geometric Progression.

\[ \frac{ar^{n+1} - a}{r - 1} \text{ when } r \neq 1 \]

This formula will then be proved through mathematical induction.

Students are assigned problems that to derive/show a formula. The following is a finance example.

Suppose an initial investment of \( P \) grows to an accumulated amount of \( A \) in \( t \) years. Show that the effective rate (annual effective yield) is

\[ r_{\text{eff}} = \left( \frac{A}{P} \right)^{1/t} - 1 \]

Applied examples such as the one below are discussed to connect the theory with the application.

Hawaiian Veggies Cooperative had sales of $1,000,000 in its first year of operation. If sales increased by 6% per year thereafter, find Hawaii Veggies Cooperative’s sales in the seventh year and its total sales over the first seven years of operation.

Listed below are some proof problems from various mathematical topics to be covered in lecture, group, and/or assigned as homework.

1. Use the definition of a logarithm to prove that \( \log_a x^r = r \log_a x \)
2. Prove that a polynomial function \( y = P(x) \) is continuous at every number \( x \).
3. Prove that the derivative of the function \( f(x) = |x| \) for \( x \neq 0 \) given by

\[ f'(x) = \begin{cases} 
1 & \text{if } x > 0 \\
-1 & \text{if } x < 0
\end{cases} \]

4. Prove the power rule of differentiation for special case \( n = 3 \).
**Hallmark 3.** Teach students how to apply formal rules of algorithms.

Students are also introduced to the formalism of rules used in solving formulas. Examples are numerous in the Calculus portion of the course.


## The Derivative

The limit (4) or (8), which measures both the slope of the tangent line to the graph of \( y = f(x) \) at the point \( P(x, f(x)) \) and the (instantaneous) rate of change of \( f \) at \( x \), is given a special name: the **derivative of \( f \) at \( x \)**.

### Derivative of a Function

The derivative of a function \( f \) with respect to \( x \) is the function \( f' \) (read "\( f \) prime"),

\[
    f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \tag{9}
\]

The domain of \( f' \) is the set of all \( x \) for which the limit exists.

Thus, the derivative of a function \( f \) is a function \( f' \) that gives the slope of the tangent line to the graph of \( f \) at any point \( (x, f(x)) \) and also the rate of change of \( f \) at \( x \) (Figure 29).

![Derivative of a Function Diagram](image)

Other notations for the derivative of \( f \) include:

\[
    \begin{align*}
        D_x f(x) & \quad \text{Read "d sub x of f of x"} \\
        \frac{dy}{dx} & \quad \text{Read "d y d x"} \\
        y' & \quad \text{Read "y prime"}
    \end{align*}
\]
The last two are used when the rule for \( f \) is written in the form \( y = f(x) \).

The calculation of the derivative of \( f \) is facilitated by using the following four-step process.

---

**Four-Step Process for Finding \( f'(x) \)**

1. Compute \( f(x + h) \).
2. Form the difference \( f(x + h) - f(x) \).
3. Form the quotient \( \frac{f(x + h) - f(x)}{h} \).
4. Compute the limit \( f''(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \).

---

Discussion/assigned problems to illustrate the use of the formal process.

I. Find the slope of the tangent line to the graph of \( f(x) = 3x + 5 \) at any point \( (x, f(x)) \).

II. Let \( f(x) = x^2 \)

   a. Find \( f'(x) \).
   b. Compute \( f'(2) \) and interpret your result.

III. The management of Lex Brady’s Tire Company has determined that the weekly demand function of the Super Titan tires is given by

\[
p = f(x) = 144 - x^2
\]

where \( p \) is measured in dollars and \( x \) is measured in units of a thousand.

Find the average rate of change in the unit price of a tire if the quantity demanded is between 5000 and 6000 tires, between 5000 and 5100 tires, and between 5000 and 5010 tires.
Hallmark 4. Require students to use appropriate symbolic techniques in the context of problem solving, and in the presentation and critical evaluation of evidence.

The use of symbolic techniques in the context of problem solving, and in the presentation and critical evaluation of evidence are essential parts of this course. Symbolic techniques are used to precisely capture the essence of mathematical information which would otherwise be difficult to represent as plain words.

The varied real problems assigned throughout the course provides for the necessary coverage of mathematical symbolic techniques. Such problems are listed below.

I. The owner of the Kauai Farmstead has 5000 yards of fencing with which to enclose a rectangular piece of grazing land along the straight portion of Waimea Stream. Fencing is not required along the river. Find a function \( f \) giving the area of grazing land if the owner uses all of the fencing.

II. If exactly 100 people sign up for a charter flight from Honolulu to Maui. Maui Island Travel charges $120 per person. However, if more than 120 people sign up for the flight (assume this is the case), then each fare is reduced by $1 for each additional person. Find a function giving the revenue realized by the company.

III. The membership of the Hawaii No Ka 'Oi Fitness Center, which opened a few years ago, is approximated by the function

\[
M(t) = 100(64 + 4t)^{2/3} \quad (0 \leq t \leq 52)
\]

where \( M(t) \) gives the number of members at the beginning of week \( t \).

a. Find \( M'(t) \).
b. How fast was the center’s membership increasing initially (\( t = 0 \))?
c. How fast was the member increasing at the beginning of the 40th week?
d. What was the membership when the center first opened? At the beginning of the 40th week.

IV. The total loans outstanding at all British banks have been declining in recent years. The function

\[
L(t) = 4.6e^{-0.04t} \quad (0 \leq t \leq 6)
\]

gives the approximate total loans outstanding from 2006 (\( t=0 \)) through 2012 in trillions of pounds.

a. What were the total loans outstanding in 2006? In 2012?
b. How fast were the total loans outstanding declining in 2006? In 2012?
Hallmark 5. Not focus solely on computational skills.

This course is about solving problems and the techniques one can employ to solve them. Emphasis will be on problem solving skills. In addition, the instructor will expose students to the importance of the results (solving the problem) and its implications. Part of this course will involve the development of models to solve Time Value of Money (TVM) problems.

A lecture, such as the concept of Mathematical Modeling, is introduced that will be the basis for students to analyze problems that they solve. The process is illustrated in the following figure (Tan, S.T., 2012, *Applied Mathematics for Managerial, Life, and Social Sciences* 6th edition, ISBN 1133108946, p. 137).

Regardless of the field from which the real-world problem is drawn, the problem is analyzed by using a process called mathematical modeling. The four steps in this process are illustrated in Figure 54.


**APPLIED EXAMPLE 2** Social Security Trust Fund Assets The projected assets of the Social Security trust fund (in trillions of dollars) from 2010 through 2037 are given in the following table.

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2037</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>2.69</td>
<td>3.56</td>
<td>4.22</td>
<td>4.24</td>
<td>3.24</td>
<td>0.87</td>
<td>0</td>
</tr>
</tbody>
</table>

The scatter plot associated with these data are shown in Figure 56a, where $t = 0$ corresponds to 2010. A mathematical model giving the approximate value of the assets in the trust fund $A(t)$, in trillions of dollars in year $t$ is

$$A(t) = 0.0000263t^4 - 0.0017501t^3 + 0.0206t^2 + 0.0999t + 2.7 \quad (0 \leq t \leq 27)$$
Hallmark 6. Build a bridge from theory to practice and show students how to traverse this bridge.

This course is primarily application oriented. Real problems are used to lead to the derivation of the theory (formulas) that are used to solve similar problems. Examples like those given in Hallmark 1 provide for the bridging of the theory and application. The instructor will complete the bridging process by walking through problems with students in class and through appropriate quiz and project assignments.

Example quiz problems involving finance are listed below.

I. Find how much money should be deposited in a bank paying interest at the rate of 4.5%/year compounded quarterly so that at the end of 6 years the accumulated amount will be $20,000.

II. Yumi started an IT consulting services for small businesses in 2005. The revenue of her company for that year was $80,000. The revenue grew by 20% in 2006 and 30% in 2007. Yumi projected that the revenue growth for her company within the next 3 years will be at least 25%/year. How much does Yumi expect his minimum revenue to be for 2010?

III. Online retail sales stood at $54.5 billion for the year 2004. For the next 2 years, they grew 33.2% and 27.8% per year respectively. For the next 6 years, online retail sales are projected to grow at 30.5%, 19.9%, 24.3%, 14.0%, 17.6% and 10.5% per year respectively. What are the projected online sales for 2012?

IV. Investment A offers a 10% return compounded semiannually, and investment B offers a 9.75% return compounded continuously. Which investment has a higher rate of return over a 3-year period?
III. Course Outline (from Curriculum Central)

Kapi‘olani Community College
BUS 250 - Applied Mathematics in Business

1. Course Alpha [required field]

BUS

2. Course Number [required field]

250

3. Addition? Deletion? Modification? If this is a modification, what actions are proposed? Is this course applying for or renewing a Diversification designation? A Foundations designation?

This is a modification for the 5 year cyclical review.

For accreditation purposes, each Kapi‘olani CC course is to be reviewed or updated no less than once every five years. Also, as part of the agreement that the Kapi‘olani CC Faculty Senate made with the other Academic/Faculty Senates in the UH system, twenty percent (20%) of all articulated courses must be reviewed each academic year.

The following changes are proposed in BUS 250:

- Slight modification in course title from "Applied Math in Business" to "Applied Mathematics in Business"
- Modification of course description
- Updating of course content, competencies, and PSLOs
- Linking of course content, competencies, and PSLOs
- Updating of Methods of Evaluation
- Updating of textbooks
- Updating of similar courses offered at other UH system campuses
- Modification of course prerequisites
- Addition of special comments for the course catalog

BUS 250 is renewing a Symbolic Reasoning Foundations designation.

4. Full Course Title for the Catalog [required field]

Applied Mathematics in Business

5. Date of this Course Outline [required field]

11/22/2013

6. Prerequisite(s) for catalog text and linking to courses (click yellow prereq button to access linking level)

MATH 103       Fundamentals of Coll Algebra
MATH 135       Elementary Functions
A grade of "C" or higher in MATH 103 or qualification for MATH 135.

7. Corequisite(s) for catalog text and for linking (click yellow coreq button to access linking level)

8. Recommended preparation for catalog text and for linking (click yellow Rec Prep button to access linking level)

   Recommended preparation: ICS 100 or ICS 101; qualification for ENG 100 or ESL 100

   ENG 100
   ESL 100
   ICS 100
   ICS 101

9. Credits [required field]

   3

10. Repeatable for additional credits?

    NO

11. Maximum number of credits for student transcript

    3

12. Cross-listed

    NO

13. Contact Hours (type) [required field]

    • LEC (lecture)

14. Contact Hours (quantity) How many hours will the student spend per week in lectures, laboratories, lecture/labs, clinical, etc.? [required field]

    3 hours lecture per week

15. Course Description [required field]

    BUS 250 covers the algebra and geometry of linear, quadratic, exponential, and logarithmic functions as applied to the mathematics of finance – annuities, perpetuities, present value and future value. BUS 250 also covers derivatives, indefinite integrals, graphical analysis, and mathematical models as applied to business, with selected coverage of algebra, geometry, and calculus emphasizing business applications and decision making.

16. Suggested Methods of Evaluation - Measures of Student Achievement [required field]
• Exam(s)
• Final Exam
• Homework
• In-class Assignment
• Project(s)

Method of Evaluation

<table>
<thead>
<tr>
<th>Exam(s)</th>
<th>Final Exam</th>
<th>Homework</th>
<th>In-class Assignment</th>
<th>Project(s)</th>
</tr>
</thead>
</table>

17. Suggested Methods of Instruction [required field]

• Class Discussion
• Computer Activities
• Individual Feedback/instruction
• Individual Exercise(s)
• Lectures
• PowerPoint(s)
• Problem-based Learning (PBL)
• Service Learning
• Small Group Activities
• Student Participation

18. General Education Student Learning Outcomes

✅ **Thinking/Inquiry** - Make effective decisions with intellectual integrity to solve problems and/or achieve goals utilizing the skills of critical thinking, creative thinking, information literacy, and quantitative/symbolic reasoning.

✅ **Level 2**

✅ **Communication** - Ethically compose and convey creative and critical perspectives to an intended audience using visual, oral, written, social, and other forms of communication.

✅ **Level 2**

✅ **Self and Community/Diversity of Human Experience** - Evaluate one's own ethics and traditions in relation to those of other peoples and embrace the diversity of human experience while actively engaging in local, regional and global communities.
**Aesthetic Engagement** - Through various modes of inquiry, demonstrate how aesthetics engage the human experience, revealing the interconnectedness of knowledge and life.

**Integrative Learning** - Explore and synthesize knowledge, attitudes and skills from a variety of cultural and academic perspectives to enhance our local and global communities.

**Level 2**

---

**GenED SLO**

Thinking/Inquiry - Make effective decisions with intellectual integrity to solve problems and/or achieve goals utilizing the skills of critical thinking, creative thinking, information literacy, and quantitative-symbolic reasoning.

Communication - Ethically compose and convey creative and critical perspectives to an intended audience using visual, oral, written, social, and other forms of communication.

Integrative Learning - Explore and synthesize knowledge, attitudes and skills from a variety of cultural and academic perspectives to enhance our local and global communities.

---

**19. Program Student Learning Outcomes Addressed**

**Program SLO**

Make effective decisions with intellectual integrity to solve problems and/or achieve goals utilizing the skills of critical thinking, creative thinking, information literacy, and quantitative-symbolic reasoning (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

Ethically, compose, convey, and interpret varied perspectives with respect to an intended audience using visual, oral, written, social, and other forms of communication (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

Evaluate one's own ethics and traditions in relation to those of other peoples and embrace the diversity of human experience while actively engaging in local, regional, and other forms of communication (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

Through various modes of inquiry, demonstrate how aesthetics engage the human experience, revealing the interconnectedness of knowledge and life (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

Explore and synthesize knowledge, attitudes, and skills from a variety of cultural and academic perspectives to enhance our local and global communities (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

---

**20. Specific course level Student Learning Outcomes [not currently used at KapCC unless required by external accreditation]**
Upon successful completion of BUS 250, the student should be able to:

<p>| Competency/Content                                                                 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | A | A |
| Solve linear, quadratic, exponential, and logarithmic equations with applications to business, such as solving for interest rates and various terms of investment |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Calculate present and future values (PV and FV) of simple and compound interest | ✔ | ✔ | ✔ | ✔ | ✔ |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Solve for PV, FV, payment, interest, and duration of ordinary/due simple annuities, sinking funds, and constant growth annuities |   |   |   |   |   |   |   |   |   | ✔ | ✔ | ✔ | ✔ |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Apply formulas for interest to solve problems involving installment buying and credit card purchases |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Apply formulas for interest to solve problems involving debt consolidation and rescheduling of debt |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Apply formulas for interest to solve problems involving government and corporate bonds |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | ✔   |</p>
<table>
<thead>
<tr>
<th>Description</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the various types of mortgage loans, construct amortization schedules, and calculate the various components of mortgage payments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply amortization tables to calculate the various components of mortgage payments and refinancing options</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master the use of financial calculators to formulate, analyze, and interpret mathematical models in business</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe the derivative of a function and apply rules for differentiation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Apply derivatives in curve sketching with applications to business, as in solving for marginal revenue/cost, marginal tax rate, minimum cost, and maximum profit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Describe the indefinite integral of a function, and apply rules for integration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**LEGEND**

1. (2.5%) Linear Functions and Associated Business Applications
2. (2.5%) Solution of Linear Systems by the Echelon Method
3. (2.5%) Addition and Subtraction of Matrices
4. (2.5%) Multiplication of Matrices
5. (5%) Simple and Compound Interest
6. (5%) Future Value of an Annuity
7. (5%) Present Value of an Annuity
8. (5%) Amortization
9. (5%) Sinking Funds
10. (2.5%) Quadratic Functions and Associated Business Applications
11. (2.5%) Exponential Functions and Associated Business Applications
12. (2.5%) Logarithmic Functions and Associated Business Applications
13. (2.5%) Limits
14. (2.5%) Continuity
15. (5%) Rates of Change
16. (5%) Definition of the Derivative
17. (5%) Techniques for Finding Derivatives
18. (2.5%) Derivatives of Products and Quotients
19. (2.5%) The Chain Rule
20. (2.5%) Derivatives of Exponential and Logarithmic Functions
21. (5%) Increasing and Decreasing Functions
22. (5%) Relative Extrema
23. (2.5%) Higher Order Derivatives
24. (5%) Concavity and Second Derivative Test
25. (5%) Absolute Extrema
26. (5%) Antiderivatives
27. (2.5%) Initial Value Problems

<table>
<thead>
<tr>
<th>Competency/Method</th>
<th>Eval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solve linear, quadratic, exponential, and logarithmic equations with applications to business, such as solving for interest rates and various terms of investment</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Calculate present and future values (PV and FV) of simple and compound interest</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Solve for PV, FV, payment, interest, and duration of ordinary/due simple annuities, sinking funds, and constant growth annuities</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Apply formulas for interest to solve problems involving installment buying and credit card purchases</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Apply formulas for interest to solve problems involving debt consolidation and rescheduling of debt</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Apply formulas for interest to solve problems involving government and corporate bonds</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Describe the various types of mortgage loans, construct amortization schedules, and calculate the various components of mortgage payments</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Apply amortization tables to calculate the various components of mortgage payments and refinancing options</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Master the use of financial calculators to formulate, analyze, and interpret mathematical models in business</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Describe the derivative of a function and apply rules for differentiation</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Apply derivatives in curve sketching with applications to business, as in solving for marginal revenue/cost, marginal tax rate, minimum cost, and maximum profit</td>
<td>✔️ ✔️ ✔️ ✔️ ✔️</td>
</tr>
</tbody>
</table>
Describe the indefinite integral of a function, and apply rules for integration

LEGEND

1. Exam(s)
2. Final Exam
3. Homework
4. In-class Assignment
5. Project(s)

<table>
<thead>
<tr>
<th>Competency/PSLO</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solve linear, quadratic, exponential, and logarithmic equations with applications to business, such as solving for interest rates and various terms of investment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Calculate present and future values (PV and FV) of simple and compound interest</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solve for PV, FV, payment, interest, and duration of ordinary/due simple annuities, sinking funds, and constant growth annuities</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Apply formulas for interest to solve problems involving installment buying and credit card purchases</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Apply formulas for interest to solve problems involving debt consolidation and rescheduling of debt</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Apply formulas for interest to solve problems involving government and corporate bonds</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Describe the various types of mortgage loans, construct amortization schedules, and calculate the various components of mortgage payments</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Apply amortization tables to calculate the various components of mortgage payments and refinancing options</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Master the use of financial calculators to formulate, analyze, and interpret mathematical models in business</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe the derivative of a function and apply rules for differentiation</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply derivatives in curve sketching with applications to business, as in solving for marginal revenue/cost, marginal tax rate, minimum cost, and maximum profit</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe the indefinite integral of a function, and apply rules for integration</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEGEND

1. Make effective decisions with intellectual integrity to solve problems and/or achieve goals utilizing the skills of critical thinking, creative thinking, information literacy, and quantitative(symbolic reasoning (AA in Liberal Arts with Concentration in Business Administration (pre-Business))
2. Ethically, compose, convey, and interpret varied perspectives with respect to an intended audience using visual, oral, written, social, and other forms of communication (AA in Liberal Arts with Concentration in Business Administration (pre-Business))
3. Evaluate one's own ethics and traditions in relation to those of other peoples and embrace the diversity of human experience while actively engaging in local, regional, and other forms of
communication (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

4. Through various modes of inquiry, demonstrate how aesthetics engage the human experience, revealing the interconnectedness of knowledge and life (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

5. Explore and synthesize knowledge, attitudes, and skills from a variety of cultural and academic perspectives to enhance our local and global communities (AA in Liberal Arts with Concentration in Business Administration (pre-Business))

22. Course Content with links [required field] (click on the blue help icon in the upper right corner for details on how to fill out this field)

<table>
<thead>
<tr>
<th>Content/Competency</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2.5%) Linear Functions and Associated Business Applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Solution of Linear Systems by the Echelon Method</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Addition and Subtraction of Matrices</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Multiplication of Matrices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%) Simple and Compound Interest</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%) Future Value of an Annuity</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%) Present Value of an Annuity</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%) Amortization</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%) Sinking Funds</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Quadratic Functions and Associated Business Applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Exponential Functions and Associated Business Applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Logarithmic Functions and Associated Business Applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Limits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Continuity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%) Rates of Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>(5%) Definition of the Derivative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>(5%) Techniques for Finding Derivatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%) Derivatives of Products and Quotients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>(2.5%) The Chain Rule</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Percentage</td>
<td>Topic</td>
<td>✔</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%)</td>
<td>Derivatives of Exponential and Logarithmic Functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%)</td>
<td>Increasing and Decreasing Functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%)</td>
<td>Relative Extrema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%)</td>
<td>Higher Order Derivatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%)</td>
<td>Concavity and Second Derivative Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%)</td>
<td>Absolute Extrema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5%)</td>
<td>Antiderivatives</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.5%)</td>
<td>Initial Value Problems</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LEGEND**

1. Solve linear, quadratic, exponential, and logarithmic equations with applications to business, such as solving for interest rates and various terms of investment
2. Calculate present and future values (PV and FV) of simple and compound interest
3. Solve for PV, FV, payment, interest, and duration of ordinary/due simple annuities, sinking funds, and constant growth annuities
4. Apply formulas for interest to solve problems involving installment buying and credit card purchases
5. Apply formulas for interest to solve problems involving debt consolidation and rescheduling of debt
6. Apply formulas for interest to solve problems involving government and corporate bonds
7. Describe the various types of mortgage loans, construct amortization schedules, and calculate the various components of mortgage payments
8. Apply amortization tables to calculate the various components of mortgage payments and refinancing options
9. Master the use of financial calculators to formulate, analyze, and interpret mathematical models in business
10. Describe the derivative of a function and apply rules for differentiation
11. Apply derivatives in curve sketching with applications to business, as in solving for marginal revenue/cost, marginal tax rate, minimum cost, and maximum profit
12. Describe the indefinite integral of a function, and apply rules for integration

23. Text and materials

24. Auxiliary Materials and Content

A calculator with both graphing and financial capabilities will be demonstrated and used frequently in BUS 250.

25. Reference Materials

26. Semester information

- FALL
- SPRING
- SUMMER

27. Effective Term [required field]

Fall 2014

28. Suggested Methods of Delivery

- Lecture
- Hybrid
- Online
- Traditional Classroom

29. Grading Options [required field]

- Audit
- Credit/NoCredit
- Letter grade

30. Grading Scale and Weighting Suggestions (reflect suggested selections from #16) [required field]

Suggested Grading Scale:

90 - 100% = A
80 - 89% = B
70 - 79% = C
60 - 69% = D
less than 60% = F

Weighting Suggestions:

30% Exams
25% Homework
20% Final Exam
15% Projects
10% In-class Assignment

Whatever method of evaluation is used, it is understood that the instructor reserves the right to make necessary and reasonable adjustments to the evaluation policies outlined.

31. Is the course required or an elective in a degree or certificate program? If yes, name the degree or certificate where the course is required.

Yes. BUS 250 satisfies the Foundation in Symbolic reasoning (FS) requirement for the AA degree in Hawaiian Studies and the AA degree in Liberal Arts and all concentrations with the exception of the AA degree with a focus on Elementary Education.

32. For what degree or certificate program(s) was the course designed? Will the course lengthen the time for the students to complete the program? Will it replace another course?

Associate in Arts in Liberal Arts, with a Concentration in Business Administration (pre-Business) for transfer to the University of Hawai‘i at Manoa, Shidler College of Business. No. No.

33. Will this course proposal increase or decrease the number of required hours needed for a certificate or degree? Yes/No If yes, provide justification.

No.

34. Will this proposal require a change in staff, equipment, facilities, or other resources?

No.

35. Do we have a full-time faculty member who meets the requirements to teach this course? If not, who will teach the course?

Yes.

36. Is this an experimental course seeking regular status? Yes/No If "Yes", what was the experimental number and when (what semesters/years) were the experimental classes offered?

No.

37. How is this course related to the educational needs and goals of the division, college, and community as reflected in the Strategic Plan? How is it related to courses and programs?

BUS 250 supports the following Kapi‘olani CC competency areas:

- Computation and communication abilities
- Quality of life as affected by technology and science
- Problem-solving and decision-making abilities
- Career choices and life-long learning
- Study in a selected program
BUS 250 satisfies the following general education requirements:

- Understanding of communication in society
- Understanding of the dynamics of change
- Understanding of the need for lifelong learning.

BUS 250 satisfies the following Associate in Arts degree competencies for Critical Thinking:

- Identify and state problems, issues, arguments, and questions contained in a body of information.
- Identify and analyze assumptions and underlying points of view relating to an issue or problem.
- Formulate research questions that require descriptive and explanatory analyses.
- Recognize and understand multiple modes of inquiry, including investigative methods based on observation and analysis.
- Evaluate a problem, distinguishing between relevant and irrelevant facts, opinions, assumptions, issues, values, and biases through the use of appropriate evidence.
- Synthesize information from various sources, drawing appropriate conclusions.

BUS 250 satisfies the following Associate in Arts degree competencies for Quantitative Reasoning:

- Apply numeric, graphic, and symbolic skills and other forms of quantitative reasoning accurately and appropriately.
- Demonstrate mastery of mathematical concepts, skills, and applications, using technology when appropriate.
- Communicate clearly and concisely the methods and results of quantitative problem solving.
- Formulate and test hypotheses using numerical experimentation.
- Define quantitative issues and problems, gather relevant information, analyze that information, and present results.

BUS 250 satisfies the following Associate in Science degree competencies:

- Employ skills and understanding in language and mathematics essential to fulfill program requirements.
- Recognize effects of technology and science on the natural and human environments.
- Understand contemporary issues and problems and respond to the impact of current conditions.
- Demonstrate proficiency in conceptual, analytical, and critical modes of thinking.
- Demonstrate competence in a selected program of study.

BUS 250 satisfies the following Business, Legal, and Technology department competencies:

- Reason mathematically and understand mathematical concepts.
- Apply mathematical reasoning and concepts in a study of the relationship of mathematics to the modern world.

BUS 250 supports the following Kapi'olani CC Strategic Plan Outcome(s)
38. Basic skills (reading, writing and analytical) needed for success in the course. The concern here is with the skill levels required of students rather than the level of material in the class.

College level reading, writing, and mathematics are expected for students to read, understand and follow textbook material and class activities.

Students must have received a qualifying score on the math placement exam or successfully completed a college level sequence of algebra courses (e.g. MATH 103 at Kapiʻolani CC) and/or college level elementary functions (e.g. MATH 135 at Kapiʻolani CC).

39. Amount (quantity) and level of reading, writing or other independent work required. As a rule of thumb, much of the reading material for a freshman level course should be at 12th or 13th grade level.

Students are expected to spend at least 8 hours per week studying (reading the text, thinking about mathematics principles and concepts, and doing homework problems). Each week, students are expected to read approximately 25-50 pages of reading assigned from their course textbook(s) and/or financial articles related to the course. The reading level of the text and articles are at the 12th or 13th grade level.

40. Amount (quantity) and level of quantitative and logical reasoning required. Where the course involves use of mathematics, a minimum of one year of high school algebra, or its equivalent, as background for the course would be required for transfer courses.

A minimum of one semester of 100-level college level algebra is required. Students must have received a qualifying score on the math placement exam or successfully completed a college level sequence of algebra courses (e.g. MATH 103 at Kapiʻolani CC) and/or college level elementary functions (e.g. MATH 135 at Kapiʻolani CC). Each week, students are expected to complete approximately 50 mathematics exercises between in-class and homework assignments from one or two chapters in the course textbook(s).

41. Background knowledge in related subject matter expected of students entering the course. Is a course based on the expectation that students will have completed normal high school courses in related areas?

BUS 250 students are expected to have background knowledge in the fundamentals of college algebra, including the modeling, graphing and solution of polynomial, rational and radical functions. In addition, students are expected to be able to solve linear, quadratic, radical and rational equations.

BUS 250 is a course based on the expectation that students will have completed normal high school courses in mathematics.
42. Expectations for student participation outside of class. Students are expected to spend at least three hours outside of class for every hour in class by means of the following activities:

- Homework Assignments
- Individual Project(s)
- Online Assignments
- Reading Assigned Text(s)

43. Justify the level of proposed course: 100 level, 200 level, 300 level, or lower than 100 level.

According to the University of Hawai‘i numbering pattern, which Kapi‘olani Community College has adopted as accepted practice, Applied Math in Business (BUS 250) is justifiably 200 level, as it is a second-year (third-semester) course in a sequence applicable toward a baccalaureate degree. Furthermore, registration for BUS 250 requires a 100-level mathematics course prerequisite of MATH 103 (or qualification for MATH 135). In addition, almost all calculus courses offered by all colleges in the University of Hawai‘i System are numbered at the 200 level, with the single exception of UH Hilo’s MATH 115.

44. Identify similar courses at other UH colleges: list college, alpha, number, title, and credits for each. If it differs in important ways, explain how.

Similar courses are offered at the following campuses:

UH Manoa:
NREM 203, Applied Calculus for Management, Life Sciences, and Human Resources, 3 credits
MATH 203 Calculus for Business and Social Sciences, 3 credits

UH Hilo: MATH 115, Applied Calculus, 3 credits
Honolulu CC: MATH 203 Calculus for Bus & Soc Science, 3 credits
Leeward CC: MATH 203 Calculus for Business and Social Sciences, 4 credits
Maui CC: MATH 203, Calculus Busn-SocSci, 3 credits
Windward CC: MATH 203 Calculus for Business and Social Sciences, 3 credits

Each of the above courses is listed as a 3 credit course, except for Leeward CC’s MATH 203, which is 4 credits to include the modeling of business and social science applications.

45. Is a similar course taught on the upper-division level by a four year UH college? If so, explain why this course is appropriate at the lower division, or how it differs from its upper-division counterpart.

No.

46. Is this course appropriate for articulation with the UH Manoa General Education Core Requirements?

Yes/No
Yes

47. Is the course currently articulated with any two or four-year program at another UH institution? If so, give details and dates of agreement(s) and explain any impact the proposed change may have upon articulation. (Please note that this is NOT a reference to UHM Gen Ed articulation.)

No.

48. Maximum enrollment per class section? (and justification if maximum enrollment is not standard) [required field]

25. This is standard maximum enrollment.

49. Number of class sections? (Indicate whether per semester or per year)

Minimum 1 section per semester.

50. Exclude from catalog? Yes/No

NO

51. Justification (explain why this curriculum action is proposed). If applicable, list explanations of how this course meets Diversification or Foundations Hallmarks.

Updating course for 5 year cyclical review.

For accreditation purposes, each Kapi'olani CC course is to be reviewed or updated no less than once every five years. Also, as part of the agreement that the Kapi'olani CC Faculty Senate made with the other Academic/Faculty Senates in the UH system, twenty percent (20%) of all articulated courses must be reviewed each academic year.

BUS 250 - Applied Math in Business - is one of the courses selected by the Business, Legal, and Technology department at Kapi'olani CC to be updated in the 2013-2014 academic year.

BUS 250 is part of the AA pre-Business curriculum for students thinking of transfer to UHM Shidler College of Business and TIM School. Currently, the UH Manoa School of Travel Industry Management and College of Business Administration require a single semester of calculus as requirements. Additionally, some upper-division social science courses at UH Manoa carry a one-semester calculus prerequisite. This course provides Kapi'olani CC students with a means of fulfilling such requirements.

BUS 250 functions as an introduction to Calculus that does not require trigonometry; as a prerequisite to other courses in social science; and as a program prerequisite to the UH Manoa College of Business Administration. BUS 250 meets the requirement for a student whose intended major requires a one-semester introduction to calculus. In particular, BUS 250 fulfills the calculus course requirement for the School of Travel Industry Management at UH Manoa; fulfills the calculus course requirement for admission into the UH Manoa College of Business Administration.

BUS 250 fulfills the Symbolic Reasoning Foundation requirement (FS) of the Associate in Arts and Bachelor in Business Administration degree. For more information about how BUS 250 - Applied Math in Mathematics meets Foundations hallmarks, please see the document.
Modification to the course description and updating of course textbooks are justified to reflect updated business applications for BUS 250.

The updating of course content and linking of course content, competencies and PSLOs are necessary to reflect the composition of BUS 250.

The slight modification in course title from "Applied Math in Business" to "Applied Mathematics in Business" is justified to reflect contemporary nomenclature in academia and industry.

The addition of special comments for the course catalog are justified to encourage students to be prepared with the technology (financial or graphing calculator) recommended for success in BUS 250.

The modification of course prerequisites are justified with the intention of student retention and success: "A grade of "C" or higher in MATH 103 or qualification for MATH 135" closely resembles the prerequisite competencies needed for entry into BUS 250.

52. Special Comments for Catalog

Students are strongly encouraged to obtain a calculator with both graphing and financial capabilities prior to the first day of class.

53. Status (active/inactive)

Active

54. Restricted to Specific Semester(s)

55. Explain the reason for and purpose of prerequisites, corequisites, and recommended preparation [Kapi'olani CC Faculty Senate requirement if have prereqs/coreqs/rec preps]

At Kapi'olani CC, the course prerequisites for BUS 250 are MATH 103 or qualification for MATH 135. Most of the content of MATH 103 is college algebra, and BUS 250 students need to know this algebra to be able to do many BUS 250 differential calculus applications such as those involving limits, implicit differentiation, absolute and relative extrema, points of inflection, related rate problems, and optimization problems.

The recommended preparation of ENG 100 or ESL 100 is intended to prepare students for reading approximately 25-50 pages of the course textbook and financial articles related to the course. Most of this reading is between the 12th and 13th grade level.

The recommended preparation of ICS 100 or ICS 101 is intended to prepare students with financial spreadsheet software, such as Microsoft Excel, which is covered in ICS 100 and 101. Although the
spreadsheet software is not taught in BUS 250, it can be used as another tool to visualize or conceptualize the mathematical content presented in the course.

56. AA General Education Area (contact the Faculty Senate for directions on completing documentation for Foundations categories FS, FW, FGA, FGB, FGC)

   AA/FS

57. AA General Education Extra

58. AS General Education Area

59. AS General Education Extra

60. Banner title (30 characters or fewer) [required field]

   Applied Math in Business
IV. Course Syllabus

---

**BUS 250 Course Syllabus**

Applied Mathematics in Business  
Business Education Department  
Kapi‘olani Community College  
Michael Paulding, Fall 2013

---

Instructor: Michael Paulding  
Email: mpauldin@hawaii.edu  
(Students should expect a response to their email within 24 hours, excluding weekends and holidays)

Classroom: Kopiko 126  
Meeting Time: Mondays/Wednesdays: 3:15pm - 4:30pm  
Laulima: [https://laulima.hawaii.edu](https://laulima.hawaii.edu)  
CRN: 31034

| “Office” Hours: Mamane 103 (BLT: Business, Legal, Technology computer lab) |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Mondays | 12:30 - 1:30pm (Mamane 103) |
| Tuesdays | 12:30 - 1:30pm (Mamane 103) |
| Wednesdays | 12:30 - 1:30pm (Mamane 103) |
| Thursdays | 12:30 - 1:30pm (Mamane 103) |
| Sundays | 8:00pm - 9:00pm  
Blackboard Collaborate (online)  
[http://tinyurl.com/michaelpaulding](http://tinyurl.com/michaelpaulding)  
Other times by appointment. |

**Please note that office hours will be held in the computer lab, Mamane 103, for several reasons:**  
1. The lab is a lively and open environment where students can collaborate and ask questions together  
2. Technology supporting BUS 250 is loaded on all machines  
3. We don’t have to squeeze into my closet-sized office 😊

**If you would like to have an individual meeting, please feel to email me and we will schedule an appointment together.**

Office: Kopiko 118  
Office Phone: 734-9308  
Office Fax: 734-9147 (shared fax machine – please include your name and mine on any transmitted documents)

(Prior versions of the textbook will not be supported)
Prerequisites: A grade of "C" or higher in MATH 103, or a grade of "C" or higher in MATH 27, or qualification for MATH 135.

Course Competencies: Upon successful completion of BUS 250, a student should have understanding of the following areas in Applied Business Mathematics:

- Algebra and geometry of linear, quadratic, exponential, and logarithmic functions
- Mathematics of finance—annuities, perpetuities, present value
- Derivatives, graphical analysis, mathematical models as applied to business
- Selected coverage of algebra, geometry, and calculus emphasizing business applications and decision making

Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>15%</td>
</tr>
<tr>
<td>Exam 2</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Homework</td>
<td>25%</td>
</tr>
<tr>
<td>Projects (3)</td>
<td>15%</td>
</tr>
<tr>
<td>In-class Assignments</td>
<td>10%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90%-100%</td>
</tr>
<tr>
<td>B</td>
<td>80%-89%</td>
</tr>
<tr>
<td>C</td>
<td>70%-79%</td>
</tr>
<tr>
<td>D</td>
<td>60%-69%</td>
</tr>
<tr>
<td>F</td>
<td>BELOW 60%</td>
</tr>
</tbody>
</table>

Academic Honesty Policy:

All course work must represent the knowledge and understanding of each individual student. Activities that result in submission of completed work not representing each student’s true understanding of course material is prohibited. You are not permitted to copy assignments from any source. You may discuss the nature of a
problem with others, but must give your own original answers for all assigned work. Students caught cheating will be subject to disciplinary action at the discretion of the instructor. Disciplinary action may include a grade of F for the course and a report of offense to the appropriate college authority for further prosecution.

Homework Policy:

Homework assignments will be due on Mondays (roughly every week, except for holidays), as posted in the course schedule below and under the “Assignments” page on Laulima and MyMathLab. I strongly encourage all students to stay ahead of the homework schedule and ask questions early. The pace of this class is simply too fast to fall behind. However, under extenuating circumstances, late homework is accepted by MyMathLab with a deduction of 20% per day late.

<table>
<thead>
<tr>
<th>WEEK</th>
<th>CHAPTER</th>
<th>TOPIC</th>
<th>HOMEWORK</th>
<th>DUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.2</td>
<td>Linear Functions and Applications</td>
<td>MyMathLab: Homework #1</td>
<td>9/4</td>
</tr>
<tr>
<td>1</td>
<td>2.1</td>
<td>Solution of Linear Systems by the Echelon Method</td>
<td>1) Linear Func &amp; Apps/Soln of Linear Sys Ech Meth</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Holiday: Labor Day</td>
<td>No class on Monday, Sept. 2\textsuperscript{nd}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.3</td>
<td>Addition and Subtraction of Matrices</td>
<td>MyMathLab: Homework #2</td>
<td>9/9</td>
</tr>
<tr>
<td>2</td>
<td>2.4</td>
<td>Multiplication of Matrices</td>
<td>2) Matrices: Add, Subtract and Multiplication</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5.1</td>
<td>Simple and Compound Interest</td>
<td>MyMathLab: Homework #3</td>
<td>9/16</td>
</tr>
<tr>
<td>3</td>
<td>5.2</td>
<td>Future Value of an Annuity</td>
<td>3) Sim&amp;Comp Int, Fut Val Annuity, Pres Val Annuity</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5.3</td>
<td>Present Value of an Annuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5.3</td>
<td>Amortization/Sinking Funds</td>
<td>MyMathLab: Homework #4</td>
<td>9/23</td>
</tr>
<tr>
<td>4</td>
<td>10.2</td>
<td>Quadratic Functions; Translation and Reflection</td>
<td>4) Amortization, Sinking Funds and Quadratic Fcns</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10.4</td>
<td>Exponential Functions</td>
<td>MyMathLab: Homework #5</td>
<td>10/2</td>
</tr>
<tr>
<td>5</td>
<td>10.5</td>
<td>Logarithmic Functions</td>
<td>5) Exponential Functions &amp; Logarithmic Functions</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Project #1 Due Exam 1 (covers 1.2 – 10.5)</td>
<td>Wednesday, October 2\textsuperscript{nd}</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEEK</th>
<th>CHAPTER</th>
<th>TOPIC</th>
<th>HOMEWORK</th>
<th>DUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>11.1</td>
<td>Limits</td>
<td>MyMathLab: Homework #6</td>
<td>10/14</td>
</tr>
<tr>
<td>7</td>
<td>11.2</td>
<td>Continuity</td>
<td>6) Limits and Continuity</td>
<td></td>
</tr>
</tbody>
</table>
BUS 250 - COURSE SCHEDULE
UP TO THE FINAL EXAM

<table>
<thead>
<tr>
<th>WEEK</th>
<th>CHAPTER</th>
<th>TOPIC</th>
<th>HOMEWORK</th>
<th>DUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>11.3</td>
<td>Rates of Change</td>
<td>MyMathLab: Homework #7</td>
<td>10/21</td>
</tr>
<tr>
<td>12</td>
<td>11.4</td>
<td>Definition of the Derivative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>12.1</td>
<td>Techniques for Finding Derivatives</td>
<td></td>
<td>10/21</td>
</tr>
<tr>
<td>9</td>
<td>12.2</td>
<td>Derivatives of Products and Quotients</td>
<td>MyMathLab: Homework #8</td>
<td>10/28</td>
</tr>
<tr>
<td>9</td>
<td>12.3</td>
<td>The Chain Rule</td>
<td>8) Product, Quotient and Chain Rules</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>12.4</td>
<td>Derivatives of Exponential Functions</td>
<td>MyMathLab: Homework #9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>12.5</td>
<td>Derivatives of Logarithmic Functions</td>
<td>9) Derivatives Exponential &amp; Logarithmic Funcs</td>
<td>11/6</td>
</tr>
</tbody>
</table>
| 11   |         | Project #2 Due
Exam 2 (covers 11.1 – 12.5) | Wednesday, November 6th         |          |

Course Policies:

1. Regular class attendance and class participation is required. In almost every class, we will be completing in-class assignments to exercise with course content individually and also in groups. The assignments are designed to serve multiple purposes, including the reinforcement of course material as well as networking with your peers. Credit will be awarded to those who attend class. In-class assignments will not be accepted if a student does not attend, unless there is an extenuating circumstance.
2. All homework assignments will be completed online, using the MyMathLab mathematics program. This software allows a student to continue to practice mathematics problems closely related to those discussed in class. The details of MyMathLab and tutorials will be provided during the first week of instruction. Please see me if you have any questions about using online software to complete your homework assignments.

3. Students are expected to behave and to put forth their best effort towards the class. Behavior that interferes with another student's learning will not be tolerated.

4. Plagiarism will not be tolerated. Plagiarism includes but is not limited to submitting, to satisfy an academic requirement, any document that has been copied in whole or part from another individual's work without identifying that individual. Failure to adhere to this standard will result in a grade of "F" for the course.

5. If, for any reason, you are unable to fulfill the requirements for this course, talk to your instructor or your counselor.
   Do not assume that if you simply stop attending classes your instructor will drop you from the course. School policy prevents an instructor from dropping a student without his/her permission. If you do not officially withdraw from the course, your instructor is required to give you an F for the course. This will remain on your college transcript permanently. If you cannot complete the course, please obtain the necessary ADD/DROP form from the Admissions office and have your instructor sign it.

---

**Important Student Information**

**Business, Legal & Technology (BLT) Department**

**STUDENT RIGHTS AND RESPONSIBILITIES**
In instructional activities, students are responsible for meeting all of the instructor's attendance and assignment requirements. Failure to do so may affect their final grade. In all college related activities, including instruction, they must abide by the college's codes and regulations, refraining from behavior that interferes with the rights and safety of others in the learning environment. Finally, if they decide to file a grievance, they are fully responsible for providing proof that they have been wronged.

**ELECTRONIC COMMUNICATION**
For the consideration of classmates, beepers must be turned to vibrate during class sessions and cell phones must be turned off. Check your messages between classes or during the break.

**EMAIL**—University of Hawai‘i Policy on Email Communication
The electronic communications policy adopted in December 2005 establishes the University of Hawai‘i internet service as an official medium for communication among students, faculty, and staff. Every member of the system has an @hawaii.edu address, and the associated username and password provide access to essential web announcements and email. You are hereby informed of the need to regularly log in to UH email and web services for announcements and mail. Failing to do so will mean missing critical information from academic and program advisors, instructors, registration and business office staff, classmates, student organizations, and others. For more information go to MyUH at [http://myuh.hawaii.edu](http://myuh.hawaii.edu).

**WORK AREA/WORKSTATIONS**
In consideration of other classroom users, please restart computers, clear workstation area of all rubbish, and return chairs to their proper position at the end of each class session.

**WITHDRAWAL**
The last day to withdraw from this class is noted on the academic calendar and deadlines at the Kapi‘olani CC website, [www.kcc.hawaii.edu](http://www.kcc.hawaii.edu). Please check this site for the latest updates. It is your responsibility to withdraw via the web or obtain the withdrawal form from the Kekaulike Information and Service Center (KISC), formerly Admission, Records, and Financial Aid offices, or from your counselor. It is to your advantage to consult with your counselor for available options. Note: If you are enrolled in only one course at the College, withdrawing from that course also withdraws you from the College.
**STUDENT CONDUCT CODE**
The University expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution; to respect the rights, privileges, and property of others; and to observe national, state, and local laws and University regulations. For more information, please refer to "Student Conduct Code," Kapi`olani Community College General Catalog.

**AUDIO AND VISUAL RECORDINGS**
Prior permission of the instructor is required for audio and/or visual recordings of lectures or class presentations. Student initiated recording(s) and use of any electronic means of capturing or transmitting lectures or class presentations are prohibited and may be subject to disciplinary action by the College. For more information, please refer to "Student Conduct Code," Kapi`olani Community College General Catalog.

**PLAGIARISM/CHEATING**
Any student, including collaborators, who cheats or plagiarizes on any quiz, exam, or assignment will receive a "zero score" and will be asked to withdraw from class. If you turn in someone else's work or reformat another person's work as your own, it is cheating. You may not share disks, files, or printouts. Be honest with yourself and with others. If you have concerns, please discuss them with your instructor. For more information, please refer to "Student Conduct Code," Kapi`olani Community College General Catalog.

**DISRUPTIVE BEHAVIOR**
Any student whose speech or actions intentionally are disrespectful, offensive, and/or threatening; interferes with the learning activities of other students; impedes the delivery of College services; or has a negative impact in any learning environment may be subject to disciplinary action by the College. For more information, please refer to "Student Conduct Code," Kapi`olani Community College General Catalog.

**ILLEGAL DRUGS AND ALCOHOL ABUSE**
In conformance with existing law, students are not permitted to manufacture, distribute, possess, use dispense or be under the influence of illegal drugs and/or alcohol as prohibited by State and federal law on campus. Students found in violation of this shall be subject to the provisions of the "Student Conduct Code." The university will cooperate with law enforcement agencies. For more information, please refer to "Student Conduct Code," Kapi`olani Community College General Catalog.

**FINAL COURSE GRADE**
Final course grades are usually posted on the web within a week after grades are due. Grade reports are not mailed to students. Check MyUH at [http://myuh.hawaii.edu](http://myuh.hawaii.edu) to view grades.

**STUDENT SUPPORT SERVICES**
For more information, please refer to "Student Support Services," Kapi`olani Community College General Catalog.

**Academic Advising** counselors assist students with course selection and planning towards graduation. Lori Sakaguchi advises BLT students with last names A-L, Kopiko 111, email ilsakagu@hawaii.edu, phone 734-9017. Cynthia Kimura advises BLT students with last names M-Z, Kopiko 109, email ckimura@hawaii.edu, phone 734-9107. BLT counselors email declared accounting, information technology, marketing, and paralegal majors important program/departamental/counseling information. Please read your @hawaii.edu email and use your @hawaii.edu email when contacting the counselors.

**Disability Services** provides support services to students with documented disabilities. Extended time in a distraction-free environment is an appropriate accommodation based on a student's disability. If you are a student with a documented disability and have not voluntarily disclosed the nature of your disability and the support you need, you are invited to contact the Disability Support Services Office, `Iliahi 113, email kapdss@hawaii.edu, or phone 734-9552 for assistance.

**Kahikoluamea** counselors and peer advisors encourage and support first-year students in their transition to college and toward the successful completion of their academic courses. Services provided include peer counseling, tutoring, academic counseling, financial aid application assistance, and connections to programs and services, `Iliahi building, phone 734-9341.
Kekaulike Information and Service Center (KISC) (formerly the Admission, Records, and Financial Aid offices) assists students regarding registration concerns, transfer credits, financial obligations, scholarships/grants/loans, on-campus employment, etc., `Ilia 102, email kapinfo@hawaii.edu, phone 734-9555.

Malama Hawai`i assists all Native Hawaiian students as well as students enrolled in Hawaiian Language, Hawaiian Studies, & Pacific Island Studies with academic, social, and cultural success. Visit them in the Manele building, phone 734-9700, or check out their Facebook (Malama Hawaii).

The Native Hawaiian Career & Technical Education Project helps Native Hawaiian students in Business, Legal & Technology Education; Culinary; Emergency Medical Services; Health Sciences; Nursing; and Hospitality and Tourism with academic, financial, career, and cultural success. Visit them in the Manele building, email nhctep@hawaii.edu, phone 734-9554.

Single Parents and Displaced Homemakers Program assists eligible single parents and displaced homemakers to gain marketable skills. Services include academic, career and personal counseling; referral networks; career/life planning seminars; financial aid; childcare information; and workshops/club activities. You are invited to contact the program in `Iliahi 201, email spdh@hawaii.edu, phone 734-9504.

TRIO-Student Support Services helps qualified low-income, first-generation students and/or students with disabilities to succeed in academics, attain their educational goals, or transfer to a four-year educational institution. You are invited to contact TRIO in `Iliahi 113, email kaptrio@hawaii.edu, phone 734-9553.

This and all other course materials are available in alternative formats upon request.