Colonnade General Education Committee

Western Kentucky University

Report to the University Senate Executive Committee

Date: April 13, 2017

From: Dr. Marko Dumančić, Chair

The Colonnade General Education Committee submits the following report for consideration to the University Senate:

Curriculum

Foundations

- **MATH 123 – Mathematical Applications for Business**

Colonnade Program Course Proposal
Foundations Category (QR)

Quantitative Reasoning

MATH 109, 116, or other approved courses. (3 hours)

Quantitative Reasoning courses teach students to interpret, illustrate, and communicate mathematical and/or statistical ideas. Students will learn to model and solve problems. Students with a Math ACT of 26 or higher will receive 3 hours credit for this requirement.

Students will demonstrate the ability to:

1. Interpret information presented in mathematical and/or statistical forms.
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually and/or numerically.
3. Determine when computations are needed and execute the appropriate computations.
4. Apply an appropriate model to the problem to be solved.
5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis.

Please complete the following and return electronically to HYPERLINK "mailto:colonnadeplan@wku.edu" colonnadeplan@wku.edu.

1. What course does the department plan to offer in ***Foundations: Quantitative Reasoning***?

   MATH 123 – MATHEMATICAL APPLICATIONS FOR BUSINESS

2. How will this course meet the specific learning objectives for this category? Please address **all** of the learning outcomes listed for the appropriate subcategory.

   Learning Objective 1: Interpret information presented in mathematical and/or statistical forms.

   Students in MATH 123 learn to interpret information presented in mathematical form by first learning to recognize the presence of mathematical information such as functions, equations, graphs, tables, or descriptive text; and secondly, to accurately interpret how to use that information in the context of business

related applications.

Specifically, students learn to:

- Distinguish between linear and non-linear data both numerically and graphically as it applies to business-related fields.
- Identify linear, quadratic, exponential and logarithmic functions expressed both symbolically and graphically as it applies to business-related fields.
- Analyze descriptive text to apply the appropriate business-related models (linear, quadratic, exponential or logarithmic) to apply in solving a particular problem.

Learning Objective 2: Illustrate and communicate mathematical and/or statistical information symbolically, visually and/or numerically.

Students in MATH 123 learn to illustrate and communicate mathematical information symbolically by learning when and how to express solutions to linear, quadratic, exponential and logarithmic functions from the perspective of a business.

Students in MATH 123 learn to illustrate and communicate mathematical information visually by learning how to graph linear, quadratic, exponential and logarithmic functions such as supply and demand and maximizing and minimizing functions.

Students in MATH 123 learn to illustrate and communicate mathematical information numerically by learning when and how to use tables to express quantitative information such as in the use of tax tables.

Learning Objective 3: Determine when computations are needed and execute the appropriate computations.

Students in MATH 123 learn to determine when computations are needed and execute the appropriate computations through the analysis of application problems and develop the skills needed to recognize necessary techniques and or formulas that are required to solve a business-related problem and carrying out the necessary algebraic procedures accurately and efficiently.

Specifically, students learn to analyze and develop skills in executing the following computations:

- Solving linear equations and inequalities such as determining and interpreting points of equilibrium, determining and interpreting when profit is less than, greater than, or equal to zero.
- Determining and interpreting average rate of change and intercepts for linear functions, as well as stating domain and range as it applies to business-related fields.
- Problem solving involving quadratic equations such as piecewise functions, tax tables, determining and interpreting maximum and minimum applications as well as their uses.
- Determining and interpreting the characteristics of a quadratic function vertex, axis of symmetry and intercepts of quadratic functions, and stating domain, range, and increasing/decreasing/constant intervals.
- Performing and computing with regression equations of the linear, quadratic, exponential, logarithmic, and power nature as it applies to a set of data and determining and analyzing best fits.
- Applying the necessary skills to appropriately solve exponential and logarithmic equations such as in population growth, compound interest, and annuities.
- Determining and interpreting intercepts of exponential and logarithmic functions, and stating domain, range, and increasing/decreasing/constant intervals.
- Computing with a system of equations in two variables to determine and analyze such concepts as when supply equals demand, and investment mixture applications.
- Use the concept of first derivatives for the optimization in business and economics as it applied to maximizing revenue and minimizing average cost for business-related applications.
- The concept of Bayes' Formula will be used to aide in the application and understanding of such concepts of employee screening, employee ratings, and product defects.

Learning Objective 4: Apply an appropriate model to the problem to be solved.

Students in MATH 123 learn to apply an appropriate model to the problem to be solved via exercises designed to teach recognition of which algebraic function, expression or equation (e.g. linear, quadratic, logarithmic, exponential) appropriately models a given problem and to develop skill in performing such applications.

Learning Objective 5: Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis.

Students in MATH 123 learn to interpret, predict, and make inferences, evaluate assumptions and assess limitations in modeling application exercises from business-related fields, which require imposing real-world assumptions and/or limitations on procedures selected and inferences made from results.

3. In addition to meeting the posted learning outcomes, how does this course contribute uniquely to the *Foundations* category (i.e., why should this course be in Colonnade)? Discuss in detail.

Math 123 is designed to give students the quantitative foundation necessary for business-related disciplines. Successful completion of this course should provide students with not only the computational skills they need, but also the quantitative literacy to recognize the applications of algebra within their disciplines. The emphasis on applications and using data to construct mathematical models is designed to bridge the gap between simply learning algebraic computation and seeing how algebra is useful in real-world business contexts. To underscore the relevance of algebra to business-related disciplines, applications will be selected to emphasize consumer math, personal finance, social and behavioral sciences, health and human services, and industrial/manufacturing uses.

4. Syllabus statement of learning outcomes for the course. NOTE: In multi-section courses, the same statement of learning outcomes must appear on every section's syllabus.

Learning Objectives: This course fulfills the Quantitative Reasoning requirement in the Foundations category of WKU's Colonnade program. As part of that program, Math 123 has the following learning objectives:

Students will demonstrate the ability to

1. Interpret information presented in mathematical, statistical forms, and/or table forms.
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually and/or numerically.
3. Determine when computations are needed and execute the appropriate computations.
4. Apply an appropriate model to the problem to be solved.
5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis.

5. Give a brief description of how the department will assess the course beyond student grades for these Colonnade learning objectives.

For MATH 123, assessment will occur at the end of the semester. To assess the course objectives, each student will complete a problem that addresses the five learning objectives. The Basic Studies Committee will randomly collect 30% of the final exams per year across all sections of MATH 123 to help assess students' mastery of the learning objectives. The following criterion will be used to assess student learning outcomes:

Each test question be scored on a 5 point scale using a common rubric
(5 -Excellent ; 4 - Good; 3 - Satisfactory; 2 - Poor; 1- Fail).

The goals will be as follows:

- Satisfactory = at least 70% of students scored 3 or better
- Unsatisfactory = under 70% of students scored 3 or better

6. How many sections of this course will your department offer each semester?

Two to three sections per semester will be offered, depending on demand.

7. Please attach sample syllabus for the course. PLEASE BE SURE THE PROPOSAL FORM AND THE SYLLABUS ARE IN THE SAME DOCUMENT.

Mathematical Applications for Business – semester

MATH 123-xxx CRN xxxxx (time and days) (location)

Course: **Mathematical Applications for Business** 3 Credit Hours

Prerequisite: High school Algebra I and II and Math ACT 22 or higher, or Math SAT 510 or higher or Math Placement Exam 14 or higher, or completion of DMA 096C with a grade of C or better.

Text: *College Mathematics for Business, Economics, Life Sciences, and Social Sciences* 13th edition, Barnett, Ziegler, and Byleen Pearson with MyMathLab :

MATH 123: **Mathematical Applications for Business** (3 hours) meets five learning objectives as part of the Colonnade Plan education requirement for quantitative reasoning. MATH 123 is a course in which graphing and problem solving are integrated throughout the study of algebraic concepts including polynomial, rational, exponential and logarithmic functions. Topics also include mathematics of finance, introduction to probability, and derivatives. This course emphasizes applications in business-related fields.

MATH 123 specifically meets the five learning objectives as detailed below:

Learning Objective 1: Interpret information presented in mathematical and/or statistical forms.

Learning Objective 2: Illustrate and communicate mathematical and/or statistical information symbolically, visually and/or numerically.

Learning Objective 3: Determine when computations are needed and execute the appropriate computations.

Learning Objective 4: Apply an appropriate model to the problem to be solved.

Learning Objective 5: Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis.

- Algebraic concepts
- Linear equations and functions
- Quadratic and special functions
- Exponential and logarithmic functions
- Mathematics of finance
- Derivatives
- Introduction to probability

Mathematical Applications for Business – semester

Instructor: XXXX Office: XXXXX

Phone: (270) xxx-xxxx **Email:** xxxxx

Office Hours:

Textbook: *College Mathematics for Business, Economics, Life Sciences, and Social Sciences* 13th edition, Barnett, Ziegler, and Byleen Pearson with MyMathLab

Calculator: Students are required to have a graphing calculator (TI 83 Plus or TI 84 Plus or Silver Edition) for classroom use. The Casio fx-115 series, TI-89 and TI-92 (and comparable calculators from other manufacturers) are prohibited.

Description: Students will be given the opportunity for remediation and retesting in order to increase their learning and improve the success rate for the course.

- Algebraic concepts
- Linear equations and functions
- Quadratic and special functions
- Exponential and logarithmic functions
- Mathematics of finance
- Derivatives
- Introduction to probability

Attendance: Attendance in this course is crucial to your success. Therefore, your attendance and punctuality are expected each day. If you miss a class, you are responsible for completing any missed work. There is an attendance policy for this course. You are permitted a maximum of 5 **absences**. **Upon the sixth absence YOU WILL BE STRONGLY INCOURAGED to withdraw from the course.** In the case of tardiness, you should check with the instructor at the end of the class to gain credit for attendance. Excessive tardiness will not be tolerated. All students will be held responsible (present or not) for material covered in class, this includes handouts and assignments. If you are absent from class, it is your responsibility (the student) to find out what was covered.

Communication: Email, Blackboard, and MyMathLab (MML) will be used primarily as a means of communication between the instructor and the students. **I do not post grades on blackboard, MML, or via WKU email**. Weekly updates are sent….read them!

Homework: Homework will be assigned daily with specific deadlines for completion.

Quizzes: There will be quizzes used as a guide to assessment.

Exams: At least four exams will be given in the course.

Final Exam: A comprehensive final exam will be given.

Course Grade: A weighted average for this course will be calculated for students who have successfully completed all four module exams and the final exam. This weighted average will be calculated using the following scale.

Homework	10%
Quizzes	10%
Module Exams 60%	(4 exams worth 15% each)
Final Exam	20%

If all modules are successfully completed, letter grades will be assigned from the weighted average using the following grading scale.

A	90 – 100
B	80 - 89
C	70 - 79
D	60 - 69
F	59 and below

Drop Date: The last day to withdraw from this course with a W is xxx.

ADA Statement: In compliance with university policy, students with disabilities who require accommodations (academic adjustments and/or auxiliary aids or services) for this course must contact the *Student Accessibility Resource Center (SARC), DSU room 1074. Please do not request accommodations directly from the instructor without a letter of accommodations from SARC.*