Northern Marianas College
CURRICULUM ACTION REQUEST

Effective Semester / Session: Spring 2014

Type of Action:

__	New
X	Modification
__	Move to Inactive (Stop Out)
__	Cancellation

Course Alpha and Number: MA 203

Course Title: Basic Calculus

Reason for initiating, revising, or canceling:
The course guide is being modified to 1) reflect the change in the college catalog, 2) modify student learning outcomes, 3) include assessment measures, 4) change the math prerequisite, and 5) update its format.

Alex Nikolaychuk — 11/26/13

Proposer — Date

Velma C. Deleon Guerrero — 11-26-2013

Interim Department Chair — Date

Barbara K. Merfalen — 11.26.13

Dean of Academic Programs and Services — Date

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Course: MA 203 Basic Calculus

1. **Department:** Sciences, Mathematics, Health & Athletics

2. **Purpose**
   The purpose of this course is to enable students to (1) develop proficiency in basic calculus, (2) discover applications of calculus by constructing models to solve real-world problems, and (3) offer an entry-level calculus course for students intent on transferring to a four-year college to earn an advanced degree in the sciences, business, or mathematics

3. **Description**

   A. **Required/Recommended Textbook(s) and Related Materials**
   Required Textbook: Anton, Howard A, et al. Calculus, 7th Edition, new York, NY, John Wiley & Sons, Inc., 2002.
   Readability level: Grade 12

   Required Calculator: TI-82/83/89 or technologic equivalent.

   B. **Contact Hours**
      1. **Lecture:** 5 hours per week / 75 per semester
      2. **Lab:**
      3. **Other:**

   C. **Credits**
      1. **Number:** 5
      2. **Type:** Regular degree units

   D. **Catalogue Course Description**
   This course introduces students to the basic theory and applications of calculus. Topics covered include a review of precalculus, limits, infinity, continuity, differentiation, and integration, and the application of these concepts to the mathematical analysis of space and time. Problem solving and the use of graphing utilities are emphasized throughout. A TI-83, or higher, graphing calculator is required. Prerequisites: MA 161 and MA 162. English Placement Level: EN 101. Math Placement level 203. (Offered Spring)

   E. **Degree or Certificate Requirements Met by Course**
   This course meets the elective requirement for any Associate of Arts or Bachelor of Science degree offered by Northern Marianas College.

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F. Course Activities and Design
Course activities include lecture, discussions, homework assignments, tests, quizzes, and a comprehensive final exam.

4. Course Prerequisite(s); Concurrent Course Enrollment; Required English/Mathematics Placement Level(s)
Prerequisite: MA 162 College Trigonometry
English Placement Level: EN 101

5. Estimated Cost of Course; Instructional Resources Needed
Cost to the Student: Tuition for a 4-credit course; cost of textbook and graphing calculator.

Cost to the College: Instructor's salary.

Instructional resources needed for this course include: a classroom equipped with chalk and chalkboard, or whiteboard, and eraser. An electronic projection and device and television and other viewing device for calculator demonstrations. A TI 82/83/89 graphic calculator with a manual and instructor's edition textbook with supplemental materials.

6. Method of Evaluation
Students grades will be based on the regular letter grade system as described below:

A: Excellent- grade points: 4.0;
B: Above average- grade points: 3.0;
C: Average- grade points: 2.0;
D: Below average- grade points: 1.0;
F: Failure- grade points: 0.0.

NMC's grading and attendance policies will be followed.

7. Course Outline
This is a topical outline and does not necessarily indicate the sequence in which the material will be presented.

1.0 Precalculus
- 1.1 Real Numbers
- 1.2 Functions
- 1.3 The Coordinate Plane and Straight Lines

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- 1.4 Graphs of Equations and Functions
- 1.5 Tangent Lines and the Derivative

2.0 Limits and Continuity
- 2.1 Limits and the Limit Law
- 2.2 One-sided Limits
- 2.3 Combinations of Functions and Inverse Functions
- 2.4 Continuous Functions

3.0 Differentiation
- 3.1 The Derivative and Rates of Change
- 3.2 Basic Differentiation Principles
- 3.3 The Chain Rule
- 3.4 Derivatives of Algebraic Functions
- 3.5 Maxima and Minima of Functions on closed Intervals
- 3.6 Applied Maximum and Minimum Problems
- 3.7 Implicit Differentiation
- 3.8 Related Rates
- 3.9 Successive Approximation and Newton's Method

4.0 Applications of Derivatives and Antiderivatives
- 4.1 Increments, Differentials, and Linear Approximations
- 4.2 The Mean Value Theorem and Applications
- 4.3 The First Derivative Test
- 4.4 Graphs of Polynomials
- 4.5 Higher Derivatives and Concavity
- 4.6 Curve Sketching and Asymptotes
- 4.7 Antiderivatives
- 4.8 Applications to Economics

5.0 The Integral
- 5.1 Elementary Area Computations
- 5.2 Riemann Sums and the Integral
- 5.3 Evaluation of Integrals
- 5.4 The Fundamental Theorem of Calculus
- 5.5 Integration by Substitution
- 5.6 Computing Areas by Integration
- 5.7 Numerical Integration

6.0 Applications of the Integral
- 6.1 Setting up Integral Formulas

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6.2 Volumes by the Method of Cross Sections
6.3 Volumes by the Method of Cylindrical Shells
6.4 Arc Length and Surface Area of Revolution
6.5 Force and Work
6.6 Centroids of Plane Regions and Curves
6.7 Approximations and Riemann Sums

8. Instructional Goals

This course will introduce students to:

1.0 Limits and the limit laws;

2.0 Continuous and non-continuous functions;

3.0 Combinations of functions and inverse functions;

4.0 The derivative and rates of change;

5.0 The properties of differentiation;

6.0 The Chain Rule and Newton's Method;

7.0 Maxima and minima problems;

8.0 Differentials and linear approximations;

9.0 The Mean Value Theorem;

10.0 Curve-sketching using derivatives;

11.0 The antiderivative;

12.0 The integral;

13.0 Riemann sums and integral evaluations;

14.0 The Fundamental Theorem of calculus;

15.0 Numerical integration

16.0 Integral formulas; and

17.0 Methods of computing volumes and surface areas using integrals.

9. Student Learning Outcomes

Upon successful completion of course, the student will be able to:

1.0 Apply the concept of limits and use the limit laws;

2.0 Identify and evaluate continuous and non-continuous functions;

3.0 Evaluate combinations of functions and inverse functions;

4.0 Use the definition

5.0 Apply the properties of differentiation to evaluate expressions and solve equations and application problems;

6.0 Apply the Chain Rule and Newton's Method to differentiate complex functions;

7.0 Find maxima and minima for graphs of polynomials;

8.0 Evaluate differentials and linear approximations;

9.0 Interpret and apply the Mean Value Theorem on differentiable functions;

10.0 Use derivatives to sketch the curves of a function;

11.0 Use the systematic procedures for solving antiderivative problems;

12.0 Define and apply the concepts of the integral;

13.0 Use Riemann sums for integral evaluation;

14.0 Define and apply the Fundamental Theorem of Calculus;

15.0 Perform numerical integration;

16.0 Set-up and evaluate integral formulas; and

17.0 Apply methods of computing volumes and surface areas using integrals.

10. Assessment Measures

Assessment of student learning may include, but not be limited to, the following:

1.0 Periodic testing and a final comprehensive examination to evaluate the student's knowledge and abilities in cognitive reasoning and the interpretation, identification, comprehension, calculation and application of the basic concepts of calculus;

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2.0 A research project using the basic principles of calculus that demonstrates an understanding of the nature of calculus; and may include graphical modes of an interpretive nature;

3.0 A student presentation that illustrates the relationship between calculus and science, engineering, and other such real-life practical application disciplines; and

4.0 Exams, quizzes, assignments, and cooperative group work. Students must also attend class regularly and participate in classroom discussions.