

# General Education Course Inclusion Proposal

## Quantitative Reasoning and Analysis

**Course Name and Number:** MA111 College Algebra with Calculus Preparation

**Home Department:** Mathematics & Computer Science

**Department Chair Name and Contact Information:** J.D. Phillips, 227-2020, jophilli@nmu.edu

**Expected frequency of Offering of the course:** every semester

**Official Course Status:** Has this course been approved by CUP and Senate? YES

### Overview of course

#### A. Overview of the course content

This course is an introduction to college algebra and to the basic functions that are studied in a calculus course (polynomial, rational, exponential and logarithmic and trigonometric). This course provides students with the ability to transform, combine, graph and solve equations involving these functions as well as develop and apply mathematical models of natural phenomena using these functions.

#### B. Explain why this course satisfies the Component specified and significantly addresses both learning outcomes

#### Critical Thinking Learning Outcomes:

- Evidence: Students are asked to solve many 'story' problems. From each story the student must assess the given information and then decide which pieces of information should be used to form a solution.
- Integrate: The exams consist of many multi-step problems. Insight gained in early steps must be integrated with well-known equations and principles to solve the problems.
- Evaluate: Students must evaluate whether the solution they found is the actual solution, not an artifact of their solution method.

#### Quantitative Reasoning and Analysis Learning Outcomes:

- Calculation: 90% or more of exam and homework problems require a mathematical calculation.
- Analysis/Application: At each stage in the process of problem-solving the student needs to analyze the current state of the data at hand to move to a new step in the process. This is true for virtually all problems given on the exams.
- Interpretation: Many problems require students to interpret a mathematical equation or graph as a model of some natural phenomena.

#### C. Describe the target audience (level, student groups, etc.)

MA111 is a 100-level course intended for those students intending to take calculus (required for many STEM majors) but who are not ready for precalculus. Many students who have not had a math class recently but want to eventually take calculus take this course.

D. Give information on other roles this course may serve (e.g. University Requirement, required for a major(s), etc.)

MA 111 is a prerequisite for calculus, which is required for mathematics, secondary education mathematics, computer science, physics, and chemistry majors (among others). MA 111 will also satisfy the new mathematics competency requirement.

E. Provide any other information that may be relevant to the review of the course by GEC

We have none at this time.

**PLAN FOR LEARNING OUTCOMES  
CRITICAL THINKING**

*Attainment of the CRITICAL THINKING Learning Outcome is required for courses in this component. There are several dimensions to this learning outcome. Please complete the following Plan for Assessment with information regarding course assignments (type, frequency, importance) that will be used by the department to assess the attainment of students in each of the dimensions of the learning outcome. Type refers to the types of assignments used for assessment such as written work, presentations, etc. Frequency refers to the number of assignments included such as a single paper or multiple papers. Importance refers to the relative emphasis or weight of the assignment to the entire course. For each dimension, please specify the expected success rate for students completing the course that meet the proficiency level and explain your reasoning. Please refer to the Critical Thinking Rubric for more information on student performance/proficiency in this area. Note that courses are expected to meaningfully address all dimensions of the learning outcome.*

<b>DIMENSION</b>	<b>WHAT IS BEING ASSESSED</b>	<b>PLAN FOR ASSESSMENT</b>
<b>Evidence</b>	Assesses quality of information that may be integrated into an argument	<ul style="list-style-type: none"> <li>❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam</li> <li>❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester.</li> <li>❖ Overall Grading Weight: Between 70% &amp; 100% for the exams, roughly 30% of this grade involves problems that would address this learning objective</li> <li>❖ Assessment: Problems requiring students to select from given information to arrive at a solution will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes.</li> <li>❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems</li> </ul>
<b>Integrate</b>	Integrates insight and or reasoning with existing understanding to reach informed conclusions and/or understanding	<ul style="list-style-type: none"> <li>❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam</li> <li>❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester.</li> <li>❖ Overall Grading Weight: Between 70% &amp; 100% for the exams, at least 60% of this grade involves problems that would address this learning objective</li> <li>❖ Assessment: Problems requiring students to select from a variety of known methods to arrive at a solution will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes.</li> <li>❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems</li> </ul>
<b>Evaluate</b>	Evaluates information, ideas, and activities according to established principles	<ul style="list-style-type: none"> <li>❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam</li> <li>❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at</li> </ul>

	and guidelines	<p>the end of the semester.</p> <ul style="list-style-type: none"><li>❖ Overall Grading Weight: Between 70% &amp; 100% for the exams, at least 90% of this grade involves problems that would address this learning objective</li><li>❖ Assessment: Problems requiring students either to identify a solution from several possible answers produced during the solution process or to recognize and coherently express the final answer will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes.</li><li>❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems</li></ul>
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**PLAN FOR LEARNING OUTCOMES**  
**QUANTITATIVE REASONING AND ANALYSIS**

*Attainment of the QUANTITATIVE REASONING AND ANALYSIS Learning Outcome is required for courses in this component. There are several dimensions to this learning outcome. Please complete the following Plan for Assessment with information regarding course assignments (type, frequency, importance) that will be used by the department to assess the attainment of students in each of the dimensions of the learning outcome. Type refers to the types of assignments used for assessment such as written work, presentations, etc. Frequency refers to the number of assignments included such as a single paper or multiple papers. Importance refers to the relative emphasis or weight of the assignment to the entire course. For each dimension, please specify the expected success rate for students completing the course that meet the proficiency level and explain your reasoning. Please refer to the Rubric for more information on student performance/proficiency in this learning outcome. Note that courses are expected to meaningfully address all dimensions of the learning outcome.*

<b>DIMENSION</b>	<b>WHAT IS BEING ASSESSED</b>	<b>PLAN FOR ASSESSMENT</b>
<b>Calculation</b>	Ability to perform mathematical/numerical operations.	<ul style="list-style-type: none"> <li>❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam</li> <li>❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester.</li> <li>❖ Overall Grading Weight: Between 70% &amp; 100% for the exams, at least 90% of this grade involves problems that would address this learning objective</li> <li>❖ Assessment: Problems requiring mathematical calculation will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes.</li> <li>❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems</li> </ul>
<b>Analysis/Application</b>	<p>Ability to manipulate quantitative data to produce new data.</p> <p>Ability to use data to make judgments and draw conclusions.</p>	<ul style="list-style-type: none"> <li>❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam</li> <li>❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester.</li> <li>❖ Overall Grading Weight: Between 70% &amp; 100% for the exams, at least 90% of this grade involves problems that would address this learning objective</li> <li>❖ Assessment: Problems requiring multiple steps / stages will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes.</li> <li>❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems.</li> </ul>
<b>Interpretation</b>	Ability to explain information presented in mathematical forms (e.g. equations, graphs,	<ul style="list-style-type: none"> <li>❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam</li> <li>❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final</li> </ul>

	diagrams, tables, and words)	<p>exam at the end of the semester.</p> <ul style="list-style-type: none"><li>❖ Overall Grading Weight: Between 70% &amp; 100% for the exams, at least 50% of this grade involves problems that would address this learning objective</li><li>❖ Assessment: Problems requiring students to use equations and / or inequalities to model situations will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes.</li><li>❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems</li></ul>
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Course syllabus –MA111 College Algebra For Calculus Preparation

Class Time: 2:00 –2:50 PM, MTWR, JXJ3100

Instructor: Richard Balding

Office: JXJ 2225

Phone: 906-227-1595 (office)

e-mail: rbalding@nmu.edu

Office hours: M,W,R 12-1:50, M,W 4-4:50

Course objective :

This course is designed to prepare highly motivated, but mathematically unprepared, students for the study of calculus in two ways: 1) expand and deepen the algebra knowledge and techniques essential for calculus, and 2) prepare the student for the increased pace necessary for calculus.

However, mastering formulas and procedures for solving routine problems (the so-called "plug and chug" mathematics) is not sufficient. You will be expected to learn to solve non-routine, multi-step problems--problems that are not just variations of worked examples--that involve the use of formulas and methods of algebra and logical extensions of these.

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

- \* Solve linear, quadratic (and quadratic-like) and absolute value equations and inequalities.
- \* Work with linear functions, including graphing, Cartesian operations, equations of lines and proportions.
- \* Manipulate and apply functions, including piecewise, composite, inverse and quadratic functions.
- \* Manipulate and solve exponential and logarithmic functions.
- \* Solve systems of equations
- \* Solve applications of all types of equations listed above.

Evaluation of these learning outcomes will be done through quizzes and tests.

**This course satisfies the Foundations of Natural Science/Mathematics requirement.**

**Students who complete this course should be able to demonstrate a basic understanding of mathematical logic; use mathematics to solve scientific or mathematical problems in college classes; express relationships in the symbolic language of mathematics; and appreciate the role of mathematics in analyzing natural phenomena.**

Requirements:

- 1) Homework will be assigned at the end of most classes. Most of the time (if at all) the homework will not be collected, but is essential to the learning of the material. The best way to learn math is to do math.
- 2) In a college class at this level, the average student should expect to spend 2 hours of study time (doing homework, reading, taking and revising notes and studying) for every hour of class time. Since this class is a 4 credit class, you should expect to spend 8 hours per week on study activities outside of class.
- 3) Your final grade will be determined from a combination of the points achieved from quizzes, tests and the final exam – a number of curve points (to be determined) will be multiplied by your attendance % (if over 80%, otherwise by 0) and added at the end. There will be 6 to 8 tests (and/or quizzes) and the final. The final will be worth about 1 ½ tests.

Required Materials:

- 1) College Algebra (5th edition), by Stewart, Redlin and Watson, Brooks/Cole, 2009.
- 2) Graphing calculator or a scientific calculator .

Material to be covered:

We will cover most of chapters 1 – 3, 5,6,8

Help: Help is available from me (during office hours or other arranged times), from the Math Lab in WS 3810 (M-R, 9-4, F, 9-5) and/or from the All Campus Tutoring. Also, meeting with other students from your class can be very helpful.



Grading scale: (Approximate)

90-100%	A's
80-89.9%	B's
70-79.9%	C's
60-69.9%	D's
below 60%	F

## **DISABILITY SERVICES**

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Dean of Students Office at 2001 C. B. Hedgcock Building (227-1700). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.