

General Education Course Inclusion Proposal

Quantitative Reasoning and Analysis

This proposal form is intended for departments proposing a course for inclusion in the Northern Michigan University General Education Program. Courses in a component satisfy both the Critical Thinking and the component learning outcomes. Departments should complete this form and submit it electronically through the General Education SHARE site.

Course Name and Number: MA 161 Calculus 1

Home Department: Mathematics & Computer Science

Department Chair Name and Contact Information (phone, email): J.D. Phillips 227 2020 jophilli@nmu.edu

Expected frequency of Offering of the course (e.g. every semester, every fall): every semester

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

Courses that have not yet been approved by CUP must be submitted to CUP prior to review by GEC. Note that GEC is able to review courses that are in the process of approval; however, inclusion in the General Education Program is dependent upon Senate and Academic Affairs approval of the course into the overall curriculum.

Overview of course (please attach a current syllabus as well): *Please limit the overview to two pages (not including the syllabus)*

A. Overview of the course content

This introductory calculus course contains a brief review of precalculus mathematics, limits, the derivative, differentiation rules, applications of the derivative, the definite integral, the Fundamental Theorem of Calculus, and an introduction to the applications of the integral.

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

Critical Thinking Learning Outcomes:

- Evidence: Students are often presented with problems (particularly “word” problems) in which they must determine what pieces of the information given should be used to find the solution.
- Integrate: In a majority of problems on exams, students are not told how to solve the given problem. They must choose from a variety of known methods to solve the given problem.
- Evaluate: The student needs to be able to recognize when they have arrived at a solution to a given problem and present the solution coherently. For example, the method chosen to produce a solution may have resulted in extraneous answers. The student must stop and evaluate which one, if any, is correct.

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 all problems requiring calculation of any sort, as well as problems requiring a mathematical proof.

- Interpretation: A substantial number of problems require students to take information given and mathematically model the situation (interpretation in its own right) and use the model to arrive at a solution.

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

MA 161 is a 100-level introductory calculus course that is required for many STEM majors. In addition to these groups, MA 161 is a course that is also useful for business school majors and economics majors wishing to attend graduate school or to enter the actuarial sciences field where a solid mathematical basis for their own disciplines.

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

Currently MA 161 is required for mathematics, secondary education mathematics, computer science, physics, and chemistry majors (among others). It counts as an elective for many other majors (for example accounting and economics) and as an elective for the mathematics and computer science minors. MA 161 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

At this time we do not have anything to add. However, if you have questions or would like us to clarify anything, please let us know.

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.

DIMENSION	WHAT IS BEING ASSESSED	PLAN FOR ASSESSMENT
Evidence	Assesses quality of information that may be integrated into an argument	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 80% & 100% for the exams, roughly 30% of this grade involves problems that would address this learning objective ❖ 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. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
Integrate	Integrates insight and or reasoning with existing understanding to reach informed conclusions and/or understanding	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 80% & 100% for the exams, at least 60% of this grade involves problems that would address this learning objective ❖ 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. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
Evaluate	Evaluates information, ideas, and activities according to established principles	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at

	and guidelines	<p>the end of the semester.</p> <ul style="list-style-type: none">❖ Overall Grading Weight: Between 80% & 100% for the exams, at least 90% of this grade involves problems that would address this learning objective❖ 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.❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
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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.

DIMENSION	WHAT IS BEING ASSESSED	PLAN FOR ASSESSMENT
Calculation	Ability to perform mathematical/numerical operations.	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 80% & 100% for the exams, at least 90% of this grade involves problems that would address this learning objective ❖ Assessment: Problems requiring mathematical calculation will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
Analysis/Application	<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"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 80% & 100% for the exams, at least 90% of this grade involves problems that would address this learning objective ❖ 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. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems.
Interpretation	Ability to explain information presented in mathematical forms (e.g. equations, graphs,	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final

	diagrams, tables, and words)	<p>exam at the end of the semester.</p> <ul style="list-style-type: none">❖ Overall Grading Weight: Between 80% & 100% for the exams, at least 50% of this grade involves problems that would address this learning objective❖ 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.❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
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Calculus I
MA 161-02 Fall 2014
MWRF 10:00 – 10:50 AM JAMR 3102

Professor: Dr. Linda Lawton
Office: Jamrich 2206
Email: llawton@nmu.edu
Office Hours: 2:00 – 3:30 MWR, or by appointment

Text: Calculus, Edition 6e, James Stewart, Thomson, Brooks/Cole, 2008.

Course description: This introductory calculus course contains a brief review of precalculus mathematics, limits, the derivative, differentiation rules, applications of the derivative, the definite integral, the Fundamental Theorem of Calculus, and an introduction to the applications of the integral.

This course satisfies the Foundation of Natural Sciences/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.

Prerequisite: Satisfactory (C- or better) completion of Math 115 or equivalent.

“Homework”: Homework problems from the text will be assigned but not collected—instead we will have daily/weekly quizzes and in-class grades (group worksheets) worth a total of 1200 daily points. I will “forgive” 200 points—i.e. if at the end of the semester you have accumulated 1000 points, you will receive 100% for your homework average. In light of this, there will not be “make-up” quizzes/worksheets—the “forgiven” 200 points accounts for necessary absences.

Exams: There will be four in-class exams spaced roughly 3½ weeks apart. Just a word of warning—make-up exams tend to be more difficult than the original. (Once a test has been given, its content tends to become widely known very rapidly—not to mention I may have already used my best (read nice) problems.)

Breakdown:

Homework:	10%	
Exam 1:	14%	
Exam 2:	17%	
Exam 3:	17%	
Exam 4:	12%	
Final:	30%	(comprehensive)

Grade scale:

91 – 100%	= A
81 – 89%	= B
71 – 79%	= C
61 – 69%	= D
< 60%	= F

Learning Outcomes (primary focus of examinations)

- The student will be able to correctly evaluate a variety of types of limits and interpret their relationship to concepts such as continuity and differentiability.
- The student will be able to select and apply the appropriate differentiation techniques.
- The student will be able to select and apply the appropriate integration techniques.
- The student will model and solve a variety of problems using integration and differentiation, including but not limited to optimization, related rates, and basic physics.

About me:

Normally I am a rather informal, laid back person—i.e. easy to deal with. (Even my husband agrees with this.) But there are a few things which tend to make me grumpy—i.e. difficult to deal with. Here's a short list (keep in mind this was developed while teaching "Math for People Who Hate Math But Have to Have One to Graduate"):

1. bad attitudes

(Please don't just sit in the back glaring at me—pretend you are enjoying yourself!!)

2. homework (or other) questions right before class starts

(I want to provide you with clear, understandable lectures, but I am easily distracted. I need that time to focus before I start class.)

3. repeatedly skipping class and expecting me to "lecture" during office hours

(I don't mind covering the material with you in my office, but there is only so much we can cover in one sitting.)

4. point grubbing

(When I grade quizzes and tests I go through all the papers twice to ensure that equivalent credit is given to equivalent work. If you feel I have made an error, please submit a written request for me to review the matter.)

5. cheating, etc.

Cheating will result in failure of not only the exam / assignment, but also the course.

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.

This syllabus is subject to change with notice.