

APPLICATION FOR NEW COURSE

1. Submitted by the College of Arts and Sciences Date: 1 September 2009

Department/Division proposing course: Mathematics

2. Proposed designation and Bulletin description of this course:

a. Prefix and Number MA 137

b. Title* Calculus I with life science applications

*If title is longer than 24 characters, offer a sensible title of 24 characters or less: Calculus I (life sci.)

c. Courses must be described by at least one of the categories below. Include number of actual contact hours per week.

CLINICAL COLLOQUIUM DISCUSSION LABORATORY LECTURE
 INDEPEND. STUDY PRACTICUM RECITATION RESEARCH RESIDENCY
 SEMINAR STUDIO OTHER – Please explain: _____

d. Please choose a grading system: Letter (A, B, C, etc.) Pass/Fail

e. Number of credit hours: 4

f. Is this course repeatable? YES NO If YES, maximum number of credit hours: _____

g. Course description:

A first course in one-variable calculus. Derivatives and integrals of elementary functions (including the trigonometric functions) with applications to the life sciences. Students may not earn credit for MA 113 and MA 137.

h. Prerequisite(s), if any:

Math ACT of 27 or above, or math SAT of 610 or above, or MA 109 and MA 112, or MA 110, or consent of the department. Students who enroll in MA 137 based on their test scores should have completed a year of pre-calculus study in high school that includes the study of the trigonometric functions. Math placement test recommended.

i. Will this course also be offered through Distance Learning? YES NO

If YES, please check one of the methods below that reflects how the majority of the course content will be delivered:

Internet/Web-based Interactive video Extended campus

3. Supplementary teaching component: N/A or Both Community-Based Experience Service Learning

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15. Is this course part of a proposed new program? YES NO

If YES, please name: This course will be part of a planned revision in the BS program for biology.

16. Will adding this course change the degree requirements for ANY program on campus? YES NO

If YES[†], list below the programs that will require this course:

Several programs that currently require MA 113, Calculus I, may want to add this course as a possible substitute. .

[†]In order to change the program(s), a program change form(s) must also be submitted.


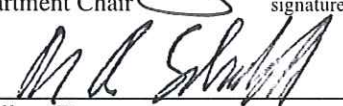
17. The major teaching objectives of the proposed course, syllabus and/or reference list to be used are attached.

18. Check box if course is 400G- or 500-level, you must include a syllabus showing differentiation for undergraduate and graduate students by (i) requiring additional assignments by the graduate students; and/or (ii) the establishment of different grading criteria in the course for graduate students. (See SR 3.1.4)

19. Within the department, who should be contacted for further information about the proposed new course?

Name: Russell Brown Phone: 859 257 3951 Email: russell.brown@uky.edu

20. Signatures to report approvals:

<u>November 30, 2009</u>	<u>ZHONGWEI SHEN</u>		
DATE of Approval by Department Faculty	printed name	Reported by Department Chair	signature
<u>12/1/2009</u>			
DATE of Approval by College Faculty	printed name	Reported by College Dean	signature
<u>2/2/2010</u>		/	
* DATE of Approval by Undergraduate Council	printed name	Reported by Undergraduate Council Chair	signature
		/	
* DATE of Approval by Graduate Council	printed name	Reported by Graduate Council Chair	signature
		/	
* DATE of Approval by Health Care Colleges Council (HCCC)	printed name	Reported by Health Care Colleges Council Chair	signature
* DATE of Approval by Senate Council	Reported by Office of the Senate Council		
* DATE of Approval by University Senate	Reported by Office of the Senate Council		

*If applicable, as provided by the *University Senate Rules*. (<http://www.uky.edu/USC/New/RulesandRegulationsMain.htm>)

MA 137 001 Calculus I for the life sciences.

Time: MWF 9-9:50, lecture, TR 9:30-10:20 recitation.

Instructor: Alberto Corso

Office: 701 Patterson Office Tower

Mailbox: 715 Patterson Office Tower

Phone: 859 257-3167 (or 859 257-3336 to leave a message)

Email: corso@ms.uky.edu

Office Hours: TR 11:00–12:15, and by appointment.

Course overview: In Calculus I for the life sciences, we will learn about derivatives, integrals and the fundamental theorems of calculus. We begin by introducing the notion of a limit. Limits are essential to defining derivatives and integrals. By the end of the semester students should know precise definitions of the derivative and the integral and the fundamental theorem of calculus which gives the relation between the derivative and the integral. We will illustrate the methods and ideas of calculus by studying several problems from biology. We will learn the interpretation of the derivative as a rate of change, and model growth and declines of populations.

Student learning outcomes:

Students will compute fluently.

Students will apply the methods of calculus in new contexts to solve unfamiliar problems.

Students will write correct justifications for their solutions to problems.

Course outline

Preview and review

Preliminaries, elementary Functions, and graphing

Discrete time models, sequences, and difference equations

Exponential growth and decay

Sequences

More population models

Limits and continuity

Limits

Continuity

Limits at infinity

The Sandwich Theorem and some trigonometric limits

Properties of continuous functions

Differentiation

- Formal definition of the derivative
- The power rule, the basic rules of differentiation, and the derivatives of polynomials
- The product and quotient rules, and the derivatives of rational and power functions
- The chain rule and higher derivatives
- Derivatives of trigonometric functions
- Derivatives of exponential functions
- Derivatives of inverse and logarithmic functions
- Approximations and local linearity

Applications of differentiation

- Extrema and the Mean Value Theorem
- Monotonicity and Concavity
- Extrema, inflection points, and graphing
- Optimization
- L'Hospital's rule
- Difference equations: stability

Integration

- The definite integral
- The Fundamental Theorem of Calculus
- Applications of integration

Text: *Calculus for Biology and Medicine* by Claudia Neuhauser.

Class Attendance and Participation: This class is designed for active involvement of the students. You will be actively supporting each other as you gain experience and understanding. Multiple ideas and points of view are important. You will benefit from hearing others' approaches to problem solving, and they will benefit from you. So attendance and active participation are expected and contribute toward your grade.

Homework: There will be regular homework assignments. Weekly quizzes will be given that are taken from the homework.

Examinations: There will be three examinations and a final.

Grading:

Class attendance and participation	10%
Homework quizzes	10%
Exams	60%
Final	20%

Grading scale:

Lowest A	90%.
Lowest B	80%
Lowest C	70%
Lowest D	60%
E	Below 60%

Working Together: Students are encouraged to work together on homework, however, they must be sure to master the material from their collaborative work. It would be best for your own understanding if you put aside your notes from the discussions with your classmates and wrote up the solutions entirely from scratch. Working together on exams, of course, is expressly forbidden.

Absences: See Students Rights and Responsibilities,
www.uky.edu/StudentAffairs/Code/part2.html,
Section 5.4.2.2, for information about valid excused absences and their verification, and making up of missed assignments.

Cheating: Cheating and plagiarism can lead to significant penalties. See Sections 6.3 and 6.4 of Student Rights and Responsibilities,
www.uky.edu/StudentAffairs/Code/part2.html.

Expectations: I expect that everyone will maintain a classroom conducive to learning. I like an informal atmosphere, but it must be orderly. Thus, everyone is expected to behave with basic politeness, civility, and respect for others. In particular, talking in class is OK if it's part of a class discussion or directed to me. Private communications are not, especially during quizzes and tests. Neither are reading extraneous materials, using electronic equipment, or sleeping.

Accommodations for students with disabilities: If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities."

Suggestions: Suggestions for improvement are welcome at any time. Any concern about the course should be brought first to my attention. Further recourse is available through the offices of the Department Ombud and the Department Chair, both accessible from the Main Office in 715 Patterson Office Tower.

Justification for Calculus sequence with life science applications.

The ideas of calculus have found many uses over the past three hundred years and remain an important part of many scientific disciplines. In recent years, the use of mathematical techniques in biology has increased. This course will serve to introduce students with an interest in biology to these important mathematical ideas.

The course will be part of a new B.S. Degree in the Department of Biology in the College of Arts and Sciences. The first semester should also be of interest to two programs in the College of Agriculture which currently accept Calculus I, MA 113 as part of their degree requirements. These programs may want to add the new course as an option for their majors.

In fall 2008, there were about 280 students enrolled in MA 123 who might have placed into MA 113. We hope that this course will serve to attract some of these students to the study of rigorous mathematics and help to produce a larger pool of students who will study science at the University.

The textbook we are using was written by a faculty member at the University of Minnesota and similar courses are being taught at Texas A&M and University of California at Davis. Like Kentucky, these schools have agriculture programs and medical schools and thus there should be demand for students who have received a rigorous undergraduate training in the biological sciences.

The first course, MA 137 will cover the same material as MA 113, with minor changes in emphasis which are necessitated by substituting biological applications for engineering and physical science applications. The second course, MA 138, will be quite different from MA 114, however approximately 50% of the material in the two courses will be the same. MA 138 will serve preparation for MA 213 and this will provide students who take these courses an opportunity to continue their study of mathematics.

Russell Brown
DUS mathematics