

## 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 138

b. Title\* Calculus II with life science applications.

\*If title is longer than 24 characters, offer a sensible title of 24 characters or less: Calculus II 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 second course in calculus. Techniques of integration, introduction to differential equations, geometry and differential calculus in several dimensions. Students may not receive credit for MA 114 and MA 138..

h. Prerequisite(s), if any:

Grade of C or better in MA 113, MA 132 or MA 137.

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   

4. To be cross-listed as: NA / \_\_\_\_\_  
Prefix and Number                      printed name                      Cross-listing Department Chair                      signature

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5. Requested effective date (term/year): Fall / 2010
6. Course to be offered (please check all that apply):  Fall  Spring  Summer
7. Will the course be offered every year?  YES  NO  
If NO, please explain: \_\_\_\_\_
8. Why is this course needed?  
This course is being offered at the request of the biology department and will be taken by their students who are pursuing the new B.S. degree in that department. .  
\_\_\_\_\_
9. a. By whom will the course be taught? Mathematics faculty
- b. Are facilities for teaching the course now available?  YES  NO  
If NO, what plans have been made for providing them?  
\_\_\_\_\_
10. What yearly enrollment may be reasonably anticipated?  
50
11. a. Will this course serve students primarily within the department?  Yes  No
- b. Will it be of interest to a significant number of students outside the department?  YES  NO  
If YES, please explain.  
\_\_\_\_\_
- The course is being offered at the request of the School of Biological Sciences as part of their new Bachelor of Science degree.
12. Will the course serve as a University Studies Program course?  YES  NO  
If YES, under what Area? \_\_\_\_\_  
†AS OF SPRING 2007, THERE IS A MORATORIUM ON APPROVAL OF NEW COURSES FOR USP.
13. Check the category most applicable to this course:
- traditional – offered in corresponding departments at universities elsewhere
- relatively new – now being widely established
- not yet to be found in many (or any) other universities
14. Is this course applicable to the requirements for at least one degree or certificate at UK?  Yes  No
15. Is this course part of a proposed new program?  YES  NO  
If YES, please name: The course is part of a planned revision to the BS program in biology.
16. Will adding this course change the degree requirements for ANY program on campus?  YES  NO

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If YES<sup>‡</sup>, list below the programs that will require this course:



As noted, this course will be part of a new B.S. Degree in biology. The course may be used as an elective by other programs in the biological sciences. In addition, some programs may accept this course as an alternative to MA 114, Calculus II.

<sup>‡</sup>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. If the 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>12/1/09</u>	<u>Ted Schatzki</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 138 001** Calculus II 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 II for the life sciences, we will learn about methods for evaluating integrals, differential equations and the first elements of calculus in several dimensions. Differential equations serve to model quantities which change over time such as biological populations. The computational techniques for integrals are needed to be able to find exact solutions to these equations. Calculus in several dimensions is useful for understanding quantities which vary with respect to position and time. Examples that will illustrate these mathematical techniques include systems of differential equations which model two species interacting in nature.

**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**

#### **Integration techniques**

- The substitution rule
- Definite integrals
- Integration by parts
- Partial fractions
- Improper integrals
- Numerical integration
- The Taylor approximation

#### **Differential equations**

- Solving differential equations
- Equilibria and their stability
- Systems of autonomous equations

#### **Linear algebra and analytic geometry**

- Linear systems
- Matrices
- Linear maps, eigenvectors and eigenvalues

Analytic geometry

Multivariable calculus

- Functions of two or more variables
- Limits and continuity
- Partial derivatives
- Tangent planes, differentiability and linearization
- More about derivatives
- Applications

Systems of differential equations

- Linear systems theory
- Linear systems and applications
- Nonlinear autonomous systems
- Nonlinear systems: applications

**Text:** *Calculus for Biology and Medicine, 2<sup>nd</sup> edition* 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](http://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](http://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](mailto: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.