

Syllabus for MATH 216
Calculus for Biological Sciences, Spring 2016
UMKC Department of Mathematics and Statistics

Content Area	Notes	Reference
Instructor Information		
Department	Mathematics and Statistics	
Name	Majid Bani-Yaghoub	http://b.web.umkc.edu/baniyaghoubm/
Contact Information	Email: baniyaghoubm@umkc.edu Tel: (816) 235- 2845 (I prefer e-mail)	baniyaghoubm@umkc.edu
Class Meeting Time/Place	Tuesday, Thursday 2:00PM - 3:40PM Katz Hall, Room 11	
Semester Offered	Spring 2016	
Instructor Office Hours and Office Location	Tuesday, Thursday 1:00PM - 2:00PM or by appointment. Office Location: Manheim 205 A	
Catalog Information		
Subject/Curricular Designation	Mathematics	www.umkc.edu/catalog
Catalog Number	Math 216	www.umkc.edu/catalog
Course Title	Calculus for Biological Sciences	www.umkc.edu/catalog
Course Description	<p>Introductory calculus designed for students in health and biological sciences. Topics include functions, limits and continuity, trigonometric functions, differentiation and its applications, integration, mathematical modeling, and discrete dynamical systems. Group projects are an integral part of this course. Credit will not be given for both MATH 216 and MATH 210.</p> <p>Extended Description: This course will introduce students to the fundamentals of differential and integral calculus as well as discrete modeling techniques in the context of the biological sciences. The successful student will develop a thorough understanding of single-variable calculus, will appreciate the utility of calculus as a tool to analyze functions that naturally arise in the study of biological systems, and will be able to place these systems in the framework of mathematical models.</p> <p>This course covers most of the material included in a traditional calculus I course (Math 210). The main difference is the modeling projects, group works and hands-on-practice. These items will help the students apply mathematics in biological sciences.</p>	www.umkc.edu/catalog

Credit Hours	4 credit hours	www.umkc.edu/catalog																		
Prerequisites/Co-Requisites	Four units of high school mathematics including trigonometry, or Math 120, or Math 110 and math 125, or Math 202	www.umkc.edu/catalog																		
Restrictions/Exclusions	None																			
Course Component (format)	Lecture																			
Course Instructional Mode	P (classroom based)																			
Course Information																				
Required and Recommended Materials	<p>1. Required Textbook: Modeling the dynamics of life: Calculus and probability for life scientists, 3rd edition, by Adler, 2012. ISBN-13: 978-0840064189</p> <p>2. Calculator: A graphing calculator such as Casio FX 9750G, TI-83/84 or TI-83/84 Plus is required for this class.</p> <p>Calculator Policy:</p> <ol style="list-style-type: none"> 1. Please bring your calculator to class every day. It is needed for class activities and modeling projects. 2. Calculators will be allowed on exams, but ALL memory must be reset and cleared. 3. Sharing calculators on exams or quizzes is not allowed. 4. Please do not have notes, formulas, applications or programs in your calculator or on its cover. These are considered cheating and will be reported to the Aggie Honor Council. 																			
Course Webpage and Resources	<p>Important dates, Syllabus and the link to student resources can be found at http://b.web.umkc.edu/baniyaghoubm/math216s16.htm</p> <p>Also, the following webpage is designed for UMKC students enrolled in Math 210 and Math 216. You may find YouTube videos of the lectures by Dr. Delaware, Copy of past Final Exams and the Tutoring Information http://roocal.wordpress.com/</p>																			
Evaluation and Grading Criteria	<table> <tr> <td>Group Work</td> <td>10 %</td> <td>A = 93-100, A – = 90-92.9</td> </tr> <tr> <td>2 Modeling projects</td> <td>20 %</td> <td>B + = 86.6-89.9, B = 83-86.5</td> </tr> <tr> <td>2 Midterm exams</td> <td>30 %</td> <td>B – = 80-82.9, C + = 76.-79.9</td> </tr> <tr> <td>Homework</td> <td>15 %</td> <td>C = 73-75.9, C – = 70-72.9</td> </tr> <tr> <td>Final Exam</td> <td><u>25 %</u></td> <td>D + = 66-69.9, D = 63-65.9</td> </tr> <tr> <td>Total</td> <td>100 %</td> <td>D – = 60-62.9, F = 0-59.9</td> </tr> </table>	Group Work	10 %	A = 93-100, A – = 90-92.9	2 Modeling projects	20 %	B + = 86.6-89.9, B = 83-86.5	2 Midterm exams	30 %	B – = 80-82.9, C + = 76.-79.9	Homework	15 %	C = 73-75.9, C – = 70-72.9	Final Exam	<u>25 %</u>	D + = 66-69.9, D = 63-65.9	Total	100 %	D – = 60-62.9, F = 0-59.9	
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<p>Assignments, Projects Assignment deadlines, Group Work</p>	<p>Homework: I will give homework on most Tuesdays during the semester. Homework includes modeling exercises, solving partial differential equations, and numerical explorations. Late homework will be marked down by 20%. Homework will not be accepted more than a week late.</p> <p>Modeling Projects: The guidelines and description of 2 different projects will be available in the Blackboard. Each group will have a project leader for a period of time and the leadership is permuted among the team members.</p> <p>The projects are due Feb. 18 & Apr. 7</p> <p>Exams: There will be two midterm exams (Mar. 1 and Mar. 24) during the class hours. The final exam (May 12, 10:30 AM) will be comprehensive. All exams are closed-book exams.</p> <p>Group Work: You will be required to form groups of 2 or 3 students and solve the problems sets given in the last 15 minutes of the class. You may hand in your group work at the end of the class period or at the beginning next class meeting.</p>	<p>https://blackboard.umkc.edu/webapps/portal/frameSet.jsp</p> <p>http://b.web.umkc.edu/baniyaghoubm/math216f13.htm</p> <p>http://roocal.wordpress.com</p>
<p>Collegiality and Group Work for Modeling Projects</p>	<p>The groups in this class are meant to imitate real-world research groups. Each group should meet once a week. Each group member should</p> <ol style="list-style-type: none"> (1) maintain a friendly environment for the entire group; (2) facilitate collaboration and problem solving; (3) provide a vision of the main objectives and ensure discussions lead to conclusions and decisions; (4) motivate and inspire other group members; (5) contribute to the group by sharing his/her knowledge, expertise and viewpoints; (6) participate in all meetings and discussions; (7) have productive suggestions. 	

<p>Instructions for preparing and presenting your modeling projects</p>	<p>The outcomes of each modeling project should be prepared in the form of PowerPoint slides as follows.</p> <p>(a) Each team is required to prepare 5-15 PowerPoint slides. (b) The contents of the slides should answer all questions asked in the project. You should also include a short Introduction, Main Objectives, Method, Results, Concluding Remarks, and Limitations. (c) The first slide must contain the name and student ID of each participant. Also include the specific works (e.g preparing slides, computing, editing and revising) done by each participant. (d) All figures and tables must have labels and captions. (e) Supplementary slides (e.g., further explanations and references) should be included in the same file after the presentation slides. (f) Please send your presentation to baniyaghoubm@umkc.edu before 1:00 PM of the due date. (g) Also a print of the file should be given to me on the due date.</p> <p>Presentation: At the end of the semester, the outcomes of the modeling projects will be presented to undergraduate biology students. Furthermore, the PowerPoint slides will be posted at MOspace (the digital institutional repository of the University of Missouri System) and it will be freely available to all researchers interested in mathematical biology</p>	
<p>Schedule of Course Topics Covered, (Important Note: Subject to change)</p>	<p>It is planned to cover the first four chapters the textbook. Also there will be supplementary topics on derivatives and integrals to be covered during the semester. Note that all supplementary course materials will be posted in the Blackboard. Below is a rough outline the topics and the anticipated schedule.</p> <p>The course schedule is subject to change.</p>	
<p>Week # 1</p>	<p>Sections 1.1-1.3 Variables, parameters, and functions in biological systems. Function composition, scaling, and shifting. Unit conversion. Linear functions. Inverse functions.</p>	
<p>Week # 2</p>	<p>Sections 1.4-1.7 Inverse trigonometric functions, Discrete-time dynamical systems. Exponential growth. Laws of exponents and logarithms. Oscillatory behavior in biological systems</p>	
<p>Week # 3</p>	<p>Sections 1.8, 1.9 Oscillations and Trigonometry, A Model of Gas Exchange in the Lung.</p>	
<p>Week # 4</p>	<p>Sections 2.1-2.6 Rates of change. Limits and continuity of functions, Definition of derivative.</p>	
<p>Weeks # 5</p>	<p>Project 1 (Due Feb. 18); Supplementary Material, Differentiability of functions, Derivatives of sums, powers, and polynomials. Derivatives of products and quotients</p>	
<p>Week # 6</p>	<p>Sections 2.7-2.9, The Second Derivative. Curvature. and Acceleration, Derivatives of Exponential and Logarithmic Functions, The Chain Rule, Review for midterm Exam 1</p>	

Week # 7	Supplementary Material , Derivatives of Trigonometric Functions, Supplemental material on Derivatives of inverse trigonometric Functions, Related rates, Implicit differentiation Midterm Exam 1 (Mar. 1)	
Week # 8	Section 3.3, Applications of derivatives Optimization, Dynamical Systems, Applications of derivatives in biology	
Week # 9	Sections 3.1, 3.2 & 3.4 Population modeling using dynamical systems. Stability in dynamical systems, Reasoning About Functions, Review for midterm Exam	
Week # 10	Midterm Exam (Mar. 24); Sections 3.5 & 3.6 Intermediate value theorem. Extreme value theorem. Rolle's theorem. Mean value theorem. Limits at infinity. Leading behavior. L'Hopital's rule.	
Week # 11	Spring Break -- No Classes	
Week # 12	Sections 4.2 & 4.3 Antiderivatives. Sigma notation, definite integral. Areas as limits. Project 2 (Due Apr. 7)	
Week # 13	Sections 4.2 & 4.3, Supplementary material Supplemental material on Integration by substitution	
Week # 14	Sections 4.4 & 4.5 Fundamental Theorem of Calculus.	
Week # 15	Sections 4.6 & 4.7, Review for Final Exam; Applications of integrals – area, averages, volumes, mass, length of a curve. May 5 is the reading day. Final Exam: Thursday, May 12, 10:30 am-12:30 pm	
Focus B – Scientific Reasoning & Quantitative Analysis	Math 216 is a Focus B course. Scientific Reasoning & Quantitative Analysis: Students will apply principles and methods of science, math, statistics and logic to solve problems and draw logical inferences. They will develop a level of quantitative literacy that enables them to comprehend and evaluate information in a broad range of contexts. Students will understand methods and principles of scientific discovery and their application to all areas of learning, including the natural and social sciences.	
Student Learning Outcomes	Compute limits using L'Hôpital's rule, apply various derivative rules and techniques including product rule, power rule, quotient rule, and chain rule; Compute linear approximations of single variable functions and analyze simple discrete population models using linear stability and graphing methods; Provide a few examples related to the outcomes of the discrete dynamical systems in biology, describe and analyze various functions by determining the relative and absolute extrema, inflection points, intervals of increase and decrease; Compute various definite and indefinite integrals, have a clear understanding of the Fundamental Theorem of Calculus, and know the definition of area as a limit and be familiar with the sigma notation; Compute the average value of a function, the area between two curves and volumes of solids.	

Course Expectations, Course Policies, Requirements and Standards for Student Coursework and Student Behavior	<p>As a student enrolled in this course, it is expected that you will:</p> <ul style="list-style-type: none"> • Attend class, participate in class discussions, and ask questions • Familiarize yourself with sections of the textbook prior to their coverage in lectures • Complete all assigned work neatly, thoroughly, and on-time • Work enough additional problems to ensure comprehension of course material • Seek assistance from instructor during office hours when difficulties arise 	
Resources & Policy Statements		
Academic Calendar	<p>Students are encouraged to review important add, drop or withdraw dates:</p>	http://www.umkc.edu/registrar/acad.asp
Academic Honesty	<p>The Board of Curators of the University of Missouri recognizes that academic honesty is essential for the intellectual life of the University. Faculty members have a special obligation to expect high standards of academic honesty in all student work. Students have a special obligation to adhere to such standards. Academic dishonesty, including cheating, plagiarism or sabotage, is adjudicated through the University of Missouri Student Conduct Code and Rules of Procedures in Student Conduct Matters.</p> <p>Academic units may have additional student codes of behavior to be referenced.</p>	School of Pharmacy Honor Codes School of Medicine Honor Codes School of Dentistry Honor Codes School of Nursing Honor Codes School of Law Honor Codes
Academic Inquiry, Course Discussion and Privacy	<p>University of Missouri System Executive Order No. 38 lays out principles regarding the sanctity of classroom discussions at the university. The policy is described fully in Section 200.015 of the Collected Rules and Regulations. In this class, students may make audio or video recordings of course activity unless specifically prohibited by the faculty member. However, the redistribution of any audio or video recordings of statements or comments from the course to individuals who are not students in the course is prohibited without the express permission of the faculty member and of any students who are recorded, including those recordings prepared by an instructor. Students found to have violated this policy are subject to discipline in accordance with provisions of Section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.</p>	Executive Order #38 (CRR 200.015)
Attendance Policy	<p>Students who have an excused absence are expected to make arrangements with instructors for alternative or make-up work. Such arrangements should be made in advance of the absence, where possible.</p>	http://www.umkc.edu/catalog/attendancepolicy

Campus Safety	Inclement weather, mass notification, and emergency response guide. Campus Police: 816-235-1515 or 911	http://www.umkc.edu/umkc/alert/ http://www.umkc.edu/police Police: 816-235-1515 or 911
Counseling and Health Services Available at UMKC	UMKC students may experience many challenges in their lives while attending college – stress, depression, suicidality, trauma, relationship issues, health concerns, etc. As your professor I care about your success and well-being, and want to make you aware of some helpful resources on campus. The UMKC Counseling Center (www.umkc.edu/counselingcenter), located at 4825 Troost in Room 206, offers a wide range of supportive services to students. Appointments can be made by calling 816.235.1635. UMKC Student Health and Wellness (http://info.umkc.edu/studenthealth/), located at 4825 Troost in Room 115, offers a full range of health care and promotion services. Appointments can be scheduled online or by calling 816.235.6133. The MindBody Connection (www.umkc.edu/mindbody) is located in the Atterbury Student Success Center in Room 112 and offers a variety of stress-reduction services.	www.umkc.edu/counselingcenter
Disability Support Services	To obtain disability related accommodations and/or auxiliary aids, students with disabilities must contact the Office of Services for Students with Disabilities (OSSD) as soon as possible. To contact OSSD call 816-235-5696. Once verified, OSSD will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. For more information go to: http://www.umkc.edu/disability/ .	http://www.umkc.edu/disability/
English Proficiency Statement	Students who encounter difficulty in their courses because of the English proficiency of their instructors should speak directly to their instructors. If additional assistance is needed, they may contact the UMKC Help Line at 816-235-2222 for assistance.	

<p>Grade Appeal Policy</p>	<p>Students are responsible for meeting the standards of academic performance established for each course in which they are enrolled. The establishment of the criteria for grades and the evaluation of student academic performance are the responsibilities of the instructor. This grade appeal procedure is available only for the review of allegedly capricious grading and not for review of the instructor's evaluation of the student's academic performance. Capricious grading, as that term is used here, comprises any of the following:</p> <ul style="list-style-type: none"> • The assignment of a grade to a particular student on some basis other than the performance in the course; • The assignment of a grade to a particular student according to more exacting or demanding standards than were applied to other students in the course; (Note: Additional or different grading criteria may be applied to graduate students enrolled for graduate credit in 300- and 400-level courses.) • The assignment of a grade by a substantial departure from the instructor's previously announced standards. 	<p>http://www.umkc.edu/catalog/gradeappeals</p>
<p>Title IX</p>	<p>Under the University of Missouri's Title IX policy, discrimination, violence and harassment based on sex, gender, and gender identity are subject to the same kinds of accountability and support applied to offenses based on other protected characteristics such as race, color, ethnic or national origin, sexual orientation, religion, age, ancestry, disability, military status, and veteran status. If you or someone you know has been harassed or assaulted, you can find the appropriate resources by visiting UMKC's Title IX Office webpage (http://info.umkc.edu/title9/) or contacting UMKC's Title IX Coordinator, Mikah K. Thompson (816.235.6910 or thompsonmikah@umkc.edu). Additionally, you can file a complaint using UMKC's online discrimination complaint form, which is located at http://info.umkc.edu/title9/reporting/report-online/.</p> <p>While most UMKC employees are required to report any known or suspected violation of Title IX, students may seek confidential guidance from the following campus locations:</p>	
<p>UMKC Counseling Service, Volker Campus 4825 Troost Ave, Suite 206 Kansas City, MO 64110 Phone – (816) 235-1635</p>	<p>UMKC Counseling Service, Health Sciences Campus Health Sciences Building 1418 2464 Charlotte Kansas City, MO 64108 Phone – (816) 235-1635 (open Tuesdays, 1-5pm)</p>	<p>Student Health and Wellness 4825 Troost Ave., Suite 115, Kansas City, MO 64110 Phone - (816) 235-6133</p>

UMKC Connect	Important information is available to undergraduate students in UMKC Connect accessed through Blackboard. Throughout the term, students may receive emails regarding course grades or academic performance. Students are expected to address information posted in a timely fashion. This information may be shared with the student's Success Network made up his or her academic advisor(s) and other campus resources so that UMKC may fully support the student's success.	
Statement of Human Rights	The Board of Curators and UMKC are committed to the policy of equal opportunity, regardless of race, color, religion, sex, sexual orientation, national origin, age, disability and status as a Vietnam era veteran. Commitment to the policy is mentored by the Division of Diversity, Access & Equity , but it is the responsibility of the entire university community to provide equal opportunity through relevant practices, initiatives and programs.	Division of Diversity, Access & Equity 5115 Oak Street (816)235-1323 Fax:(816)235-6537 umkcaffirmativeaction@umkc.edu http://www.umkc.edu/diversity/index.asp
Discrimination Grievance Procedures for Students	Discrimination Grievance Procedures for Students can be found here: http://www.umsystem.edu/ums/rules/collected_rules/grievance/ch390/grievance_390.010	http://www.umsystem.edu/ums/rules/collected_rules/grievance/ch390/grievance_390.010 http://www.umkc.edu/diversity/documents/complaintprocess.pdf