
MATH 181 - 4 Credits – Section A

Calculus and Mathematical Modeling for the Life Sciences I

Syllabus / Course Outline¹ – Fall 2016

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Office Hours: Tuesday and Friday at 10:00 am and Thursday at 12:10 pm and by appointment.

In the event you absolutely can not make it to any of my office hours I am available by appointment. The purpose of the office hour is to go over problems you have trouble with, clarify concepts covered in class and discussing grades.

Lectures: Lecture will be on MT RF@ 11:00-11:50 am in Carver 305.

Course Webpage: All course information and materials will be posted in [Blackboard Learn](#)

Course Text: *Calculus for the Life Sciences: A Modeling Approach* By James L. Cornette and Ralph A. Ackerman. Published and distributed by the Mathematical Association of America. This is an eBook, that you can purchase at <http://www.maa.org/ebooks/CLS>. The book has a cost of \$35, upon purchase you will be able to download a protected PDF file to three computers. iOS (iPad & iPhone) and Android devices can open secure PDFs using the AWRReader app (available in the App Store and the Play Store). The iOS app uses the native iPad PDF reader so it is a very basic reader, no frills. Linux is not supported at this time for MAA's secure PDFs.

Prerequisites: Satisfactory performance on placement exam, 2 years of high school algebra, 1 year of high school geometry, 1 semester of trigonometry or enrollment in MATH 142.

Calculators and Other Electronic Devices: You may use any calculator that does not have wireless communication features. Calculators are permitted on all exams; however, *the instructor reserves the right to allow calculators during quizzes, depending on its true need during such.* Also, whether calculator is allowed or not *answers without procedure will result in considerable loss of points.* Other electronic devices, such as laptops, iDevices, etc., may be used during lecture for *educational purposes only.*

Homework: Homework will be assigned with the main purpose of students gaining practice and achieve a better understanding of the material. A small portion of the problems assigned will be collected to comprise a 10% of the final grade. Students should first attempt to complete the homework by themselves before seeking outside help, such as other students and the professor. There is no penalty for students working together, on the contrary it is encouraged that students work in groups for a more engaging experience in the problem solving process.

Exams: There will be 3 in-class exams (Comprising 40 % of the final grade). See tentative dates below. There will be a final exam, which is comprehensive and will count 25% of the final grade. The exams are closed books and closed notes. Exams must be taken during the scheduled times.

¹This document is subject to adjustment by the instructors, with notice given to the students.

Quizzes: There will be 6 Quizzes. Please note that **the last quiz will take place during Dead Week on Tuesday December 6, 2016.** Quizzes will comprise a 20% of the final grade.

Participation: Random attendance checks and occasional group work will count towards 5% of the final grade.

Grading Policy: The final grade will be computed as follows:

Quizzes	20%
Exams	40%
Final Exam (Cumulative)	25 %
Participation	5 %
Homework	10 %
Total	100%

An overall score of 90% or better guarantees at least an A-; 80% or better guarantees at least a B-; 70% or better guarantees at least a C-. These thresholds might be adjusted down at the end of the semester.

Any issues regarding the grading of the exams, quizzes and homework must be addressed within two weeks of the date when the paper is returned. After that time no score changes will be allowed.

Tentative Schedule:

Week	Dates	Special Event	Sections Covered
W1	8/22-8/26		1.1-1.5
W2	8/29-9/2		1.6-1.10
W3	9/5-9/9	Labor Day (No Class Monday) Quiz 1 (Thursday)	2.1-2.4
W4	9/12-9/16	Review & Exam 1 (Thursday)	2.6, 2.7
W5	9/19-9/23		2.7-2.8, 3.1
W6	9/26-9/30	Quiz 2 (Friday)	3.2, 3.3
W7	10/3-10/7	Review & Exam 2 (Thursday)	3.5
W8	10/10-10/14		3.6, 4.1, 4.3, 4.4, 4.5
W9	10/17-10/21	Quiz 3 (Tuesday)	4.6, 5.1, 5.2
W10	10/24-10/28	Quiz 4 (Friday)	5.4, 5.5
W11	10/31-11/4		5.6, 6.1, 6.2
W12	11/7-11/11	Review & Exam 3 (Thursday)	6.3
W13	11/14-11/18		7.1, 7.2, 8.1
W-	11/21-11/25	Thanksgiving Break	No Classes
W14	11/28-12/2	Quiz 5 (Friday)	8.2
W15	12/5-12/9	Dead Week, Quiz 6 (Tuesday 12/6)	Review

Blackboard: Grades and other class materials will be posted in Blackboard.

Accommodations: Please address any special needs or special accommodations with Dr. Castillo-Gil at the beginning of the semester or as soon as you become aware of your needs. Those seeking accommodations based on disabilities should obtain a Student Academic Accommodation Request (SAAR) form from the Disability Resources (DR) office (515-294-6624). DR is located on the main floor of the Student Services Building, Room 1076. *No retroactive accommodations will be provided in this class.*

Conduct and Academic Dishonesty: Students are expected to behave in a respectful manner during lecture, and *you will be asked to leave the lecture if you are being inappropriate and/or disruptive*. Academic dishonesty in any form is in violation of Iowa State University Student Disciplinary Regulations and will not be tolerated. This includes, but is not limited to: copying or sharing answers on tests or assignments, plagiarism, and having someone else do your academic work. Depending on the act, a student could receive an F grade on the test/assignment, for the course, and could be suspended or expelled from the University. See the Conduct Code at www.dso.iastate.edu/ja for more details and a full explanation of the Academic Misconduct policies.

Make up Policies: There will be NO makeup exams/quizzes with the exception of medical emergencies or university approved absences. To allow make up examinations appropriate documentation must be presented. A request must be made in advance to make up the exam to be missed, unless of course, the reason is a last minute emergency (such as an illness, dead in the family, accident, etc.) In these cases contact the instructor as soon as possible. If any of the exams is missed for a reason other than the listed as legitimate excuses (as per university policies) there will be no make up allowed, such as personal trips, job interviews, sleeping-in, etc.

Extra Credit: Occasionally there might be a possibility to earn extra credit on the exams and/or quizzes. Extra credit will not be assigned on an individual basis; and most importantly, no extra credit assignments will be available upon request at the end of the semester to improve grades. Students will **NOT** be given the opportunity to complete old assignments at the end of the semester to improve their grades.

Learning Outcomes: Upon completion of this course the student should be able to use exponential and logarithmic functions as well as difference equations and derivatives to model problems in the biological sciences.

Course Objectives : The student who successfully completes this course should be able to:

Mathematical Models of Biological Processes

- Build a mathematical model from experimental data of bacterial growth.
- Solve the difference equation $P_{t+1} - P_t = rP_t$
- State and use the definitions of Doubling time and Half-life
- Solve the difference equation $P_{t+1} - P_t = rP_t + b$

The Derivative

- Compute limits of ratios of polynomials as the variable goes to a finite or infinite limit.
- Compute simple derivatives from the definition.
- Compute derivatives using quick rules.

Applications of Derivatives

- Find the equation of the tangent to the graph of a function.
- Tell where the functions are increasing and where they are decreasing.
- Find the maxima and minima of functions.
- Solve word problems to find maxima and minima.
- Use the chain rule.

More Advanced Differentiation

- Solve equations involving exponential and logarithmic functions.
- Differentiate exponential and logarithmic functions.
- Differentiate sine and cosine functions.
- Solve word problems involving exponential, logarithmic, and trigonometric functions.
- Compute and use second derivatives.