COURSE: Biomathematics
TuTh 11:30pm-12:45pm in Janet & Walter Sondheim Building #109

PROFESSOR: Hye-Won Kang
Office: Math/Psych Building #424
Email: hwkang@umbc.edu
Office Hours: Tuesday during 9am-10am and Thursday during 12:45pm-1:45pm, or by appointment.
I will try to respond to all emails in the same day. However during the weekends, I am not available to answer them.

GRADER: Janita Patwardhan
Email: janita1@umbc.edu

TEXT: A Course in Mathematical Biology: Quantitative Modeling with Mathematical and Computational Methods, by de Vries, Hillen, Lewis, Müller, and Schönfisch; SIAM Monographs on Mathematical Modeling and Computation. Textbook is required in class.

COURSE DESCRIPTION:
Topics in this course include: Introductions to discrete-time dynamical and continuous time differential equations with an emphasis on nonlinear interactions applied to biological systems; Basic stability analysis, graphical analysis, solution techniques; Introduction to probability to address randomness in biological processes including probability distributions; Basics of descriptive statistics in relation to the probabilistic models.

PREREQUISITE:
You must have completed MATH 152 or MATH 221 with a grade of "C" or better.

GRADING POLICY:
Grades are based on quizzes, homework, a midterm exam, a final exam, and a final group project (project report and presentation). Final letter grade is decided based on the total grade as follows:

Letter Grade	**Total Scores**
A	$90 \leq \text{Total} \leq 100$
B	$80 \leq \text{Total} < 90$
C	$70 \leq \text{Total} < 80$
D	$60 \leq \text{Total} < 70$
F	$\text{Total} < 60$

However, factors such as overall distributions of grades or consistency in homework and midterm exams will affect on the final letter grade. Contributed portions of the total score are as follows:

QUIZZES	**HOMEWORK**	**MIDTERM**	**FINAL EXAM**	**FINAL PROJECT**	**TOTAL**
10%	20%	20%	25%	25%	100%

QUIZZES:

There will be quizzes twice a week and each of them is due by the time before the class starts. You are required to read the textbook ahead and fill out the quiz in Blackboard (located under \Assignments\Quizzes) before the class. The materials covered in the quiz will be learned in the class. All problems in the quiz will be graded, and your lowest two grades will be dropped.

HOMEWORK:

There will be weekly assignments and it is due every Tuesday. You are required to turn in your homework to me before the class, which are assigned in the materials learned on Tuesday and Thursday a week before. All problems in every homework will be graded, and your lowest two grades will be dropped. You are encouraged to discuss together but copying from other students is NOT allowed. Also, copying from a solution manual is PROHIBITED. Any violation will result in ZERO grade and will be reported to the University Academic Integrity Committee. Late homework will NOT be accepted.

MIDTERM EXAM:

One midterm will be taken as take-home exam (March 8-15). Chapters for the midterm are given in the schedule of the course.

FINAL EXAM AND PROJECT:

All Math 355 students are required to take a final exam covering the topics listed on this syllabus and a final project. The final exam will be taken during 10:30am-12:30pm (May 17) and the final group project is due by May 22. The final group project should be submitted ELECTRONICALLY ONLY. You can write the project by hand or you can type them using MS Word or other software. In case you write them by hand, they should be LEGIBLE.

SCHEDULE OF EXAMS:

Midterm Exam: March 8-15, 2018 (take-home)
Final Project Presentation: May 3, 8, 10, 2018 during the lecture
Final Exam: May 17, 2018 10:30am-12:30pm
Final Project: All material should be submitted electronically due by May 22, 2018.

MAKE UP EXAM AND MISSED EXAM POLICY:

In very emergency case only, you can ask for a make-up exam. You must notice to the instructor at least 10 days before the original exam date. Make-up exams will be taken before the original exam date. In case, you do not notice for a make-up exam and missed it, there will be no make-up exam AT ANY CASE except for the cases with serious excuse (ex. sickness with written statement from a doctor, funeral with written statement, etc).

ATTENDANCE:

The attendance is not mandatory, but is highly recommended. Based on the previous experience, students who attend every lecture have a very higher tendency to get a higher score at the end. When you come to the class, you are expected to participate in the class. I ask that you bring a textbook, you are on time, and pay attention to the class. No excuse for being habitually late and the use of smartphones during class is strongly discouraged. Please do not distract yourselves and other students.

CALCULATOR:

During exams, you can only use a scientific calculator. However, you need to explain every part based on the mathematical reasoning.

INCOMPLETE:

If you do complete the course successfully except for a very small portion or a final exam due to very extraordinary and emergence situation (such as to stop attending school for the rest of the semester due to injury in an accident), you will be considered to get Incomplete. You are required to submit a written statement and evidence describing reason to get Incomplete. If the reason to get Incomplete is because you are behind in the course, I would recommend to drop the course, instead.

GETTING HELP:

There are lots of places you can get help. Tutoring is available through the Learning Resources Center (https://lrc.umbc.edu) and for athletes, the Athletic Department.

ACADEMIC INTEGRITY:

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of disciplinary action that may include, but is not limited to, suspension or dismissal. See the Faculty Handbook, or the UMBC Policies section of the UMBC directory. https://oue.umbc.edu/ai/

APPROXIMATE COURSE SCHEDULE:

This course will cover various topics. The below is the approximate schedule of the course which is subject to change. The changed schedule will be updated regularly on the course web page in Blackboard.

WEEK	DATES	SECTIONS	TOPICS
1	Tu Jan 30	1.1-1.4, Q1	Introduction: The Modeling Process, Probabilities and Rates, Model Classes
	Th Feb 1	2.1, Q2	Discrete-Time Models
2	Tu Feb 6	2.2, Q3	Scalar Discrete-Time Models
	Th Feb 8	8.2, Q4	Matlab Simulation of Discrete-Time Models
Friday, February 9, is the last day to withdraw from the course without receiving a 'W' on your transcript.			
3	Tu Feb 13	2.3, Q5 **HW1 due**	Systems of Discrete-Time Models From Sections 2.1-2.2
	Th Feb 15	3.1-3.3, Q6	Ordinary Differential Equations: Scalar Equations, Systems of Equations
4	Tu Feb 20		No class
	Th Feb 22		No class

WEEK	DATES	SECTIONS	TOPICS
5	Tu Feb 27	3.3-3.4, Q7	Ordinary Differential Equations: Systems of Equation, Qualitative Analysis 2×2 Systems
	Th Mar 1	8.4, Q8	Ordinary Differential Equations: Applications to an Epidemic Model and a Predator-Prey Model
		HW2 due	From Sections 8.2, 2.2-2.3
6	Tu Mar 6	4.1-4.2, 8.5, Q9	Partial Differential Equations: Partial Derivatives, An Age Structured Model
	Th Mar 8	**Midterm Exam**	**Sections 1.1-1.4, 2.1-2.3, 3.1-3.4, 8.2, and 8.4.** Some Review will be given during the class.
		HW3 due	From Sections 3.1-3.4, and 8.4
7	Tu Mar 13		No class
	Th Mar 15	4.3, Q10	Partial Differential Equations: Reaction-Diffusion Equations (**Midterm Exam is due before the class begins.**)
8	Tu Mar 20	Spring Break	No class
	Th Mar 22	Spring Break	No class
9	Tu Mar 27	Project	Discuss possible project topics
		HW4 due	From Sections 3.1-3.4, and 8.4
	Th Mar 29	4.3, Q11	Partial Differential Equations: Reaction-Diffusion Equations (cont.)
10	Tu Apr 3	5.1-5.2, Q12	Stochastic Models: Markov Chains
	Th Apr 5	5.3-5.4, Q13	Stochastic Models: Working with Random Variables, Diffusion Processes
		HW5 due	From Sections 4.1-4.3
Monday, April 9, is the last day to withdraw from the course <u>with</u> receiving a 'W' on your transcript.			
11	Tu Apr 10	5.6, Q14	Stochastic Models: Pure Birth Process
	Th Apr 12	5.6, Q15	Stochastic Models: Linear Birth and Death Process
		HW6 due	From Sections 5.1-5.4
12	Tu Apr 17	5.6, 8.3, Q16	Stochastic Models: Linear Birth and Death Process (cont.)
	Th Apr 19	8.6, Q17	Gillespie's Algorithm
13	Tu Apr 24	Project	**Project Preparation (Group meeting)**
	Th Apr 26		Gillespie's Algorithm
		HW7 due	From Sections 5.6, 8.3, and 8.6
14	Tu May 1	Project	**Project Preparation (Group meeting)**
	Th May 3	Project	Project Presentation
15	Tu May 8	Project	Project Presentation
	Th May 10	Project	Project Presentation
		HW8 due	From Gillespie's Algorithm

WEEK	DATES	SECTIONS	TOPICS
16	Tu May 15	Review	Review for Final Exam
	Th May 17	**Final Exam**	**Sections 4.1-4.3, 5.1-5.4, 5.6, 8.1.2-8.1.3, 8.3, and 8.6, Gillespie algorithm**
17	**Tu May 22**	**Final Project**	**Final Project due date, submit electronic copy only by email**