MAT 286: CALCULUS FOR THE LIFE SCIENCES II – FALL 2020

Course Supervisor: Abdellatif Bourhim, 313J Carnegie, abourhim@syr.edu. Please inform your instructor of any problems you have with this course. Problems not satisfactorily resolved with your instructor should be brought to the attention of the course supervisor without delay.

Course Description: This is the second course in a two-course, terminal calculus sequence. It is designed to introduce students to the beauty and power of calculus. Topics include, integration, areas and volumes, double integrals and differential equations. Applications to the life sciences are emphasized.

Course Restrictions/Prerequisites: MAT 285 must be successfully completed before taking MAT 286. Students planning to major in a physical science, engineering or mathematics should take MAT 295-296-397 sequence.

Liberal Arts Core: This course is the second course in the Quantitative Skills sequence MAT 285-MAT286.

Text: *Calculus for the Life Sciences,* by Greenwell, Ritchey and Lial; Addison Wesley, 2nd Edition. The course covers Chapters 7, 8, part of Chapter 9 and Chapter 11.

Calculator: A graphing calculator is required for this course and the TI-84 or TI-83 calculator is recommended. Students who already own and know how to use another equivalent calculator (e.g. TI-85 or TI-86) are free to use it.

Homework:

1. **Online Homework:** Homework will be done online using WeBWorK, an open-source homework system for math and sciences courses. The number of attempts is unlimited. Problems can be done in any order. You do not have to do them all at once. Your instructor is going to announce the due dates of online homework.

   WEBWORK ACCESS INFORMATION:

   - Go to http://webwork.syr.edu/
   - Click on the class name ``MAT_286_Fall_2020_xxxx" (xxxx stands for your Instructor's last name).
   - Your username is your NetID in lower case letters (for example, ``jqpublic").
   - Your password is initially set to be your 9-digit SUID. You should change it after logging in for the first time. Also, note that even if you used WeBWorK before for another course, the password is reset to your 9-digit SUID.

2. **Written homework:** Below are suggested homework problems for each section. These are for your practice and will not be handed in or graded. It is also a good idea to try the review exercises at the end of each chapter.
   - Section 7.1: 5-47 odd.

- Section 7.2: 3-63 odd.
- Section 7.3: 19-22.
- Section 7.4: 1-51 odd and 63-75 odd.
- Section 7.5: 1-27 odd and 31-32.
- Section 8.2: 1-29 odd and 51-55 odd.
- Section 8.3: 1-19 odd and 26-35.
- Section 8.4: 1-35 odd.
- Section 9.5: 1-27 odd and 49-57 odd
- Section 11.1: 1-33 odd and 44, 46, 47, 50, 5, and 52.
- Section 11.2: 1-21 odd.
- Section 11.6: 10-16.

Quizzes: Each week, there will be a quiz. Your instructor will announce the quiz policies for your section of the course.

Tests: There will be three midterm tests and a final exam during the semester, each accounting for 15% of your final grade. The tests will be online through Blackboard, you must do your own work and follow the submission requirements noted in Blackboard.

Final Exam: Final exam will be given on **Monday, December 07, 2020** online through Blackboard.

Exam schedule: The exam days are firm. How much is covered by those days may differ from section to section. Your instructor will make clear what topics will be covered on each exam. Exams will be administered online. It is student's responsibility to have a reliable internet connection for the exams.

Exam	Date
Test1	An 80-minutes period from 1:00AM to 12:00PM ET on Sunday 09/20/2020
Test2	An 80-minutes period from 1:00AM to 12:00PM ET on Sunday 10/18/2020
Test3	An 80-minutes period from 1:00AM to 12:00PM ET on Sunday 11/22/2020
Final Exam	A 2-hours period from 1:00AM to 2:30PM ET on Monday 12/07/2020

Make-up Exams: There will be no make-up exams. When an exam is missed for a reason deemed valid by the instructor, the missing grade will be replaced, without penalty, by a student's score on the final exam.

Calculation of Course Grade: There will be three midterm tests during the semester and a final exam, each counts for 15% towards the final grade. The weekly quizzes and homework will count for 20% each. Final letter grades will be given according to the following scale:

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Raw score x	Letter Grade		Raw score x	Letter Grade
0<=x<60	F		80<=x<83	B-
60<=x<70	D		83<=x<86	B
70<=x<73	C-		86<=x<90	B+
73<=x<76	C		90<=x<93	A-
76<=x<80	C+		93<=x<=100	A

Class Attendance and Participation: You are expected to attend and participate in every class/lecture. Missing class/lecture is the most common reason for poor performance in the course. **If you miss a class/lecture, you are responsible for obtaining notes for that class from a student who attended. It is also your responsibility to find out about any quizzes or homework or announcements made in class.**

Masks in Class: Students attending in person class must wear a mask that covers the nose and mouth at all times, maintaining a distance of six feet from others, and stay away from class if you feel unwell.

Students who cannot wear masks due to disabilities: Students who are seeking accommodations for the mandatory mask policy should be registered with the Center for Disability Resources (CDR, formerly the Office of Disability Services). Because this policy addresses public health, students cannot be in the classroom without a face covering.

Food and Drink in Class: Eating and drinking require the lowering of the face mask, creating a potentially dangerous situation. For this reason, students are not allowed to eat or drink in class during the COVID-19 pandemic.

Available student assistance: Your instructor will hold regular office hours and will make appointments with students having class conflicts with their scheduled office hours. He/she will announce how and when he/she will hold his/her office hours. In addition, the Mathematics Department offers regular math clinics. These will be set up by the second week of the semester and a schedule of the clinics will be posted outside the math office and on the department's website. In addition, Math department offers free help and Math Clinic. Information will be made available by the instructor as well as at math.syr.edu (http://math.syr.edu/people/office-hours.html and http://math.syr.edu/undergraduate/math-help.html) by the second week of the semester.

Orange Success: (tools to access a variety of SU resources, including ways to communicate with advisors and faculty members) can be found at: http://orangesuccess.syr.edu/getting-started-2/

Students with disabilities: Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to meet with me to discuss strategies and/or accommodations (academic adjustments) that may be essential to your success and to collaborate with the Center for Disability Resources (CDR) in this process.

If you would like to discuss disability-accommodations or register with CDR, please visit their website at https://disabilityservices.syr.edu. Please call (315) 443-4498 or email disabilityservices@syr.edu for more detailed information.

CDR is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact CDR as soon as possible to begin this process.

Religious observances policy: Syracuse University's Religious Observances Policy recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their traditions. Under the policy, students should have an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors no later than the end of the second week of classes for regular session classes and by the submission deadline for flexibility formatted classes. Student deadlines are posted in MySlice under Student Services/Enrollment/My Religious Observances/Add a Notification. I ask you to include this information, as well as your expectations for how and when academic requirements will be made up, in your syllabus. I also ask you to remind students during the first week of classes about the notification deadline. Instructors may access a list of their students who have submitted a notification in the MySlice Faculty Center. Note that the religious observances icon will not appear unless a student in that class has submitted a notification.

Stay Safe Pledge: Syracuse University's Stay Safe Pledge reflects the high value that we, as a university community, place on the well-being of our community members. This pledge defines norms for behavior that will promote community health and well-being. Classroom expectations include the following: wearing a mask that **covers the nose and mouth at all times**, maintaining a distance of six feet from others, and staying away from class if you feel unwell. Students who do not follow these norms will not be allowed to continue in face-to-face classes; repeated violations will be treated as violations of the Code of Student Conduct and may result in disciplinary action.

Online Etiquette: *Please review online etiquette rules:*
https://answers.syr.edu/display/AC/Netiquette+for+Students

Academic Integrity: Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions

determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. Syracuse University students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check- in on MySlice.

The Violation and Sanction Classification Rubric establishes recommended guidelines for the determination of grade penalties by faculty and instructors, while also giving them discretion to select the grade penalty they believe most suitable, including course failure, regardless of violation level. **Any established violation in this course may result in course failure regardless of violation level.**

All academic integrity expectations that apply to in-person quizzes, homework and exams also apply to online quizzes and exams. In this course, all work submitted for quizzes and exams must be yours alone. Discussing quiz or exam questions with anyone during the quiz or exam period violates academic integrity expectations for this course."

"Using websites that charge fees or require uploading of course material to obtain exam solutions or assignments completed by others and present the work as your own violates academic integrity expectations in this course." Related link: http://class.syr.edu/academic-integrity/policy/

Use of Class Materials and Recordings: Original class materials (handouts, assignments, tests, etc.) and recordings of class sessions are the intellectual property of the course instructor. You may download these materials for your use in this class. However, you may not provide these materials to other parties (e.g., web sites, social media, other students) without permission. Doing so is a violation of intellectual property law and of the student code of conduct.

Discrimination or Harassment: Federal and state law, and University policy prohibit discrimination and harassment based on sex or gender (including sexual harassment, sexual assault, domestic/dating violence, stalking, sexual exploitation, and retaliation). If a student has been harassed or assaulted, they can obtain confidential counseling support, 24-hours a day, 7 days a week, from the Sexual and Relationship Violence Response Team at the Counseling Center (315-443-8000, Barnes Center at The Arch, 150 Sims Drive, Syracuse, New York 13244). Incidents of sexual violence or harassment can be reported non-confidentially to the University's Title IX Officer (Sheila Johnson Willis, 315-443-0211, titleix@syr.edu, 005 Steele Hall). Reports to law enforcement can be made to the University's Department of Public Safety (315-443-2224, 005 Sims Hall), the Syracuse Police Department (511 South State Street, Syracuse, New York, 911 in case of emergency or 315-435-3016 to speak with the Abused Persons Unit), or the State Police (844-845-7269). I will seek to keep information you share with me private to the greatest extent possible, but as a professor I have mandatory reporting responsibilities to share information regarding sexual misconduct, harassment, and crimes I learn about with the University's Title IX Officer to help make our campus a safer place for all.

Important Dates:

- **First Day of Classes:** Monday, August 24, 2020

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- **Add Deadline:** Monday, August 31, 2020
- **PASS/FAIL OR AUDIT** – Monday, September 7, 202
- **Financial/Academic Drop Deadline:** Monday, September 14, 2020 (100% tuition adjustment)
- **Withdrawal Deadline:** Wednesday, November 18, 2020 (WD posts to transcript)
- **Last Day of Classes:** Tuesday, November 24, 2020

Course Objectives and Learning Goals:

- To reinforce prior understanding of functions, including linear, polynomial, exponential, logarithmic and trigonometric functions.
- To understand what an integral is, how to compute integrals (limits, formulas), and how integrals can be used.
- To correctly use and understand the usage of mathematical notation.
- To develop critical thinking and problem solving skills.
- To be able to select an appropriate mathematical model for a given real world problem.
- To be able to do hand calculations accurately and appropriately.

How to Succeed: Here are a few basic suggestions for how to succeed in this course.

1. It is absolutely essential that you understand how to solve the assigned homework problems and, more importantly, how and why the skills and techniques presented in the course are used in solving the assign problems. Quiz and exam questions will be similar to these problems.
2. Ask questions in lecture and/or at the clinic about anything that is not completely clear. Don't hesitate to bring questions to your instructors during office hours.
3. Every day, read and study the sections in the textbook covered in the lecture. Learning mathematics takes time! Read carefully and work through all the examples in complete detail. It can be helpful to try to work through an example on your own before reading the solution.
4. Stay caught up. Mathematical concepts build on each other cumulatively and you need to stay on top of the material at every stage. If you are having difficulty, don't expect that the problem will take care of itself and disappear later. Contact your course instructor or your recitation instructor immediately and discuss the problem!
5. Form a study group. Many students benefit from a study group to work through challenging problems and to review for exams. You should attempt the problems ahead of time by yourself and then work through any difficulties with your study partners. Explaining your reasoning to another student can help to clarify your own understanding.
6. You should expect to work hard. Don't get discouraged if you find some of the material very difficult. Be persistent and patient! If you follow the above suggestions, your experience in this course will be a rewarding one.

Course Schedule:

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Week	Section	Topics
Week 1: **Sunday 08/23- Saturday 08/29**	7.1: Antiderivatives, Indefinite Integrals and applications.	- Antiderivatives - Indefinite integrals - Basic rules of integrations (Constant multiple rule and sum or difference rules). - Power rule - Integrals of exponential functions. - Basic trigonometric integrals.
Week 2: **Sunday 08/30- Saturday 09/05**	7.2: Substitution 7.3: Area and definite integrals 7.4: The fundamental theorem of calculus	Substitution and more trigonometric integrals Approximation of area Definite integrals The fundamental theorem of calculus, Properties of definite integrals
Week 3: **Sunday 09/06- Saturday 09/12**	7.4: The fundamental theorem of calculus 7.5 Area between two curves.	Substitution, area between the x-axis and the curve of a function. Area between two curves.
Week 4: **Sunday 09/13- Saturday 09/19**	8.2: Integration by parts Review – Test1	Formula and examples
Week 5: **Sunday 09/20- Saturday 09/26**	Test1 8.2: Integration by parts 8.3: Volume and average area	A 2-hours period from 1:00AM to 12:00PM on Sunday 09/20/2020 to solve the whole test, scan it and upload it on blackboard. Column integration and examples Volume of the solid of revolution formed by rotating about the x-axis a region between the curve of a function and the x-axis. Average value of a function.
Week 6: **Sunday 09/27- Saturday 10/03**	8.4: Improper Integrals	Review about limits at +/- infinity (MAT285) and improper integrals: Definitions and examples.

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Week 7: **Sunday 10/04- Saturday 10/10**	8.4: Improper Integrals 9.5: Double integrals	Improper integrals: Examples Definite integrals of functions of two variables
Week 8: **Sunday 10/11- Saturday 10/17**	9.5: Double integrals Review-Test2	Double integrals over rectangles, Fubini's theorem, double integrals over general regions.
Week 9: **Sunday 10/18- Saturday 10/24**	Test2 11.1 Separable differential equations	A 2-hours period from 1:00AM to 12:00PM on Sunday 10/18/2020 to solve the whole test, scan it and upload it on blackboard. Differential equations: Definitions, General solution, Particular solution, Initial Value problem and elementary differential equations
Week 10: **Sunday 10/25- Saturday 10/31**	11.1 Separable differential equations	Separable differential equations Applications: Exponential growth (Unlimited growth), Limited growth, Logistic growth.
Week 11: **Sunday 11/01- Saturday 11/07**	11.2 Linear first order differential equations	Solving linear first order differential equations (The integrating factor method)
Week 12: **Sunday 11/08- Saturday 11/14**	11.6 Applications of differential equations	Mixing problems
Week 13: **Sunday 11/15- Saturday 11/21**	11.6 Applications of differential equations Review-Test3	Mixing problems
Week 14: **Sunday 11/22- Tuesday 11/23**	Test3 Catch up	A 2-hours period from 1:00AM to 12:00PM on Sunday 11/22/2020 to solve the whole test, scan it and upload it on blackboard.