

NCSU DEPARTMENT OF MATHEMATICS
MA 231 -- Calculus for Life and Management Sciences B
Fall Semester 2019 Information for Instructors

The new 14th edition of the text *Calculus and Its Applications* by Goldstein, Lay and Schneider was used in MA 131, so most of your students will already have copies. Some students (e.g., transfers) will have no copy of Goldstein. One can be obtained at the bookstore, located on the shelf for MA 131.

MA 231 is the second course of a two-semester sequence in calculus, designed for students who require a brief overview of the basic concepts, including modeling and differential equations. The first course in the sequence, and a prerequisite for MA 231, is MA 131. Relative to the engineering calculus sequence there is here more emphasis on concepts and ideas, less on manipulations and proofs. Formulas and techniques should be made plausible, rather than rigorous. Follow the text materials in this regard. The students are in fields (textiles, forestry, economics, biological sciences) where multivariate techniques and modeling using differential equations are important tools. These form the central coverage of MA 231.

There are three major topics in MA 231:

1. Multivariate calculus - partial derivatives, Lagrange multipliers, multiple integrals.
2. Series, including Taylor Series.
3. Differential equations.

Our experience has shown that Topic 1, Multivariate Calculus, is the most difficult of the three, primarily due to the students' lack of skill in differentiation and integration. For this reason, time has been added to the schedule for Chapter 7. Please stress the concepts and keep the functions which are to be integrated or differentiated relatively simple. The first meeting is devoted to review. Please review the concepts and the basic techniques covered in MA 131.

The material on series goes well if you follow the text and do not try to do too much. (For instance, do not discuss convergence tests.) A discussion of computational questions, how many terms to include and how to assess accuracy, is useful, but omit problems.

"Word problems" should play a central role in this course. MA 231 is not intended to be easier than the analogous engineering calculus courses, but it is different. Put extra stress on concepts and applications. They form a very important part of the course.

The attached syllabus and day-by-day schedule are meant as suggestions and are for classes that meet three times per week. Tues-Thurs schedules can be developed from this. The extra days at the end can be used earlier if you need to spend more time on a particular topic.

Please contact me if you have any questions.

Molly Fenn (mafenn2@ncsu.edu)

MA 231: Calculus for Life and Management Sciences B

Instructor: Dr. Molly Fenn

Email: mafenn2@ncsu.edu

Textbook : Calculus and Its Applications by Goldstein, Lay, Asmar, Schneider. 14th edition. 2013. Pearson. Cost: \$150

Course Description

Functions of several variables - partial derivatives, optimization, least squares, Lagrange multiplier method; differential equations - population growth, finance and investment models, systems, numerical methods; MA 121 is not an accepted prerequisite for MA 231.

Course Learning Outcomes

After successfully completing this course, students will be able to:

1. Use the techniques of partial differentiation to explore the properties of a function of two or more variables;
2. Set up and solve optimization problems in various contexts;
3. Use least squares to fit linear and nonlinear functions to a given data set;
4. Give examples of how and why different disciplines use differential equations and mathematical models;
5. Create a mathematical model that describes a given problem from biology, economics, or business;
6. Carry out numerical simulations and mathematical analyses of a model.

Course Website

We will be using the *Moodle* learning management system (<http://wolfware.ncsu.edu>) for this course. You will login using your Unity ID and password. After the beginning of the semester, you will see a link to our course site. Once in the site, you can Bookmark or add the site as a Favorite in your web browser so that you can return directly to that page.

Course Communications

Modes of communication in use for this course include email, office hours, and Moodle discussion forums. Office hours will be held on Thursdays after class, from 10 until 12.

- Moodle discussion forums will be used to facilitate class discussion. Check these forums often and please feel free to reply to your fellow students' posts.
- I will do my best to respond to weekday e-mails and posts within 24 hours. Email messages or posts left after 4 pm Friday will be responded to by the following Monday.
- If you would like to speak with me in person and you can't make it to my posted office hours, please email me to schedule a time that is convenient. Include several time slots that would work for you in your email.

Please be aware that ALL email communications for this course will be sent to your NCSU unity email. If you do not regularly use your ncsu.edu account, there are settings within Gmail that allow you to forward your e-mail to another account.

Homework Policies

Homework will be done through WebAssign (webassign.ncsu.edu). To use WebAssign you will need to purchase an access code online via credit card. The access costs around \$30 per course.

Note that your end-of-semester WebAssign average will be the total number of points you earned divided by the possible number of points. This means some assignments with many possible points are worth a larger percentage of your grade.

If you have a homework question that the whole class may benefit from hearing the answer to, please post on the “Homework Questions and Hints” forum. I will check this forum often to respond to open questions. You should also check frequently to answer or ask questions.

If you have a homework question that is very specific to the work you have done (i.e. if you nearly finished your work but got stuck towards the end), you can email me with your question. Including a scan or photo of your work can help.

If I receive an email with a question more appropriate to the forum, I may copy and paste the question there without identifying the student who sent it.

Final Grade Calculation

There are 5 components to this course: homework, three 1-hour tests and one 3-hour final exam. These components will be weighted as follows.

Homework: **15%**

Your WebAssign average is calculated as the points you earned at the end of the semester divided by the total points possible throughout the semester. It is NOT calculated on an assignment by assignment basis. This means some assignments are worth more than others, pay attention to how many points each one is!

One hour tests: **60%**

Each test is worth 20% of your grade.

Final Exam: **25%**

Your lowest test grade can be replaced by your final exam grade if the final exam grade is higher. In this case, your final exam will be worth 45% of your final average.

This course uses standard NCSU letter grading (with NO ROUNDING):

| | | |
|-------------------|------------------|-----------------------|
| $90 \leq A- < 93$ | $93 \leq A < 97$ | $97 \leq A+ \leq 100$ |
| $80 \leq B- < 83$ | $83 \leq B < 87$ | $87 \leq B+ < 90$ |
| $70 \leq C- < 73$ | $73 \leq C < 77$ | $77 \leq C+ < 80$ |
| $60 \leq D- < 63$ | $63 \leq D < 67$ | $67 \leq D+ < 70$ |
| $0 \leq F < 60$ | | |

Course Website

We will be using the Moodle learning management system (<http://wolfware.ncsu.edu>) for this course. You will log in using your Unity ID and password. (Refer to online information at <http://oit.ncsu.edu/unityid> or contact (919) 515-HELP or HELP@ncsu.edu)

for assistance with your Unity ID). After the beginning of the semester, you will see a link to our course site. Once in the site, you can Bookmark or add the site as a Favorite in your web browser so that you can return directly to that page.

Course Communications

Modes of communication in use for this course include email, office hours, and Moodle.

- Moodle discussion forums will be used to facilitate class discussion. Check these forums often and please feel free to reply to your fellow students' posts.

- I will do my best to respond to weekday e-mails and posts within 24 hours. Email messages or posts left after 4 pm Friday will be responded to by Monday evening.

- If you would like to speak with an instructor in person and you can't make it to the posted office hours, please email me to schedule a time that is convenient. Include several time slots that would work for you in your email.

Please be aware that ALL email communications for this course will be sent to your NCSU unity email. If you do not regularly use your ncsu.edu account, there are settings within Gmail that allow you to forward your e-mail to another account. For more information, please see

<http://google.ncsu.edu/what-best-way-forward-my-nc-state-gmail-non-nc-state-e-mail-address>.

If you have a question that the whole class may benefit from hearing the answer to, please post on the "Course Content Q&A" forum. I will check this forum often to respond to open questions. You should also check frequently to answer or ask questions.

If you have a question that is very specific to the work you have done (i.e. if you nearly finished your work but got stuck towards the end), you can email your instructor with your question. Including a scan or photo of your work can help. If an instructor receives an email with a question more appropriate to the forum, she may copy and paste the question there without identifying the student who sent it.

Academic Integrity

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at <http://policies.ncsu.edu/policy/pol-11-35-01>

The [NCSU Student Code of Conduct](#) covers all work done in this course. Any suspected violations will be promptly reported. Academic dishonesty will result in an automatic failing grade for the course.

Course Evaluations

A formal evaluation is conducted by the University at the end of the semester and the goal is to achieve 100% class participation in this survey. Online class evaluations will be available for students to complete during the last two weeks of class. Students will receive an email message directing them to a website where they can login using their Unity ID and complete evaluations. All evaluations are confidential; instructors will never know how any one student responded to any question, and students will never know the ratings for any particular instructor.

Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Resources Office (<https://dro.dasa.ncsu.edu/>), 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at <http://policies.ncsu.edu/regulation/reg-02-20-01>.

Make Up Tests

Should you need to miss an in-class test, a cumulative makeup test will be given during class time in the last week of the semester. Everyone will take the same makeup exam, regardless of which test you missed. The grade for the makeup exam will be used in place of the grade for the test you missed. Details about the makeup test will be sent to students eligible to take it later in the semester. Only students who missed a test are eligible to take the makeup exam.

Trans-Inclusive Statement

In an effort to affirm and respect the identities of transgender students in the classroom and beyond, please contact me if you wish to be referred to using a name and/or pronouns other than what is listed in the student directory.

Basic Needs Security

Any student who faces challenges securing their food or housing or has other severe adverse experiences and believes this may affect their performance in the course is encouraged to notify the professor if you are comfortable in doing so. Alternatively, you can contact the Division of Academic and Student Affairs to learn more about the Pack Essentials program (<https://dasa.ncsu.edu/pack-essentials/>)

Supporting Fellow Students in Distress

As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom (as well as the campus as a whole) remains a healthy and safe environment for learning. Occasionally, you may come across a classmate whose personal behavior concerns or worries you, either for your classmate's well-being, for your well-being or for the well-being of others. When this is the case, I would encourage you to report the behavior on the link located on NC State's Students of Concern website (<http://go.ncsu.edu/NCSUcares>).

List of Policies

Students are responsible for reviewing the NC State University PRRs (policies, rules and regulations) that pertain to their course rights and responsibilities:

- Equal Opportunity and Non-Discrimination Policy

Statement <https://policies.ncsu.edu/policy/pol-04-25-05/> with additional references at <https://oied.ncsu.edu/equity/policies/>

- Code of Student Conduct <https://policies.ncsu.edu/policy/pol-11-35-01/>
- Grades and Grade Point Average <https://policies.ncsu.edu/regulation/reg-02-50-03/>
- Credit-Only Courses <https://policies.ncsu.edu/regulation/reg-02-20-15/>
- Audits <https://policies.ncsu.edu/regulation/reg-02-20-04/>

MA 231 SCHEDULE

Note – The following schedule is based on 43 MWF class meetings. TT schedules should be adjusted accordingly.

| LECTURE | SECTIONS | TOPICS |
|---------|--|--|
| 1. | REVIEW | Review differentiation and antidifferentiation |
| 2. | 7.1 | Functions of several variables |
| 3. | 7.2 | Partial derivatives |
| 4. | 7.2 | Partial derivatives |
| 5. | 7.3 | Maxima and minima |
| 6. | 7.3 | Maxima and minima |
| 7. | 7.3, 7.5 | Maxima and minima, Least Squares |
| 8. | 7.5 | Least Squares |
| 9. | 7.4, | Lagrange Multipliers |
| 10. | 7.4, | Lagrange Multipliers |
| 11. | REVIEW -- Supplementary Exercises, pages 427-428 | |
| 12. | REVIEW | |
| 13. | TEST #1, THROUGH ASSIGNMENT FOR DAY 12 | |
| 14. | 7.6 | Double integrals |
| 15. | 7.6 | Double integrals |
| 16. | 11.1 | Taylor Polynomials |
| 17. | 11.1 | Taylor Polynomials |
| 18. | 11.2 | Newton-Raphson Method |
| 19. | 11.3 | Geometric Series and applications |
| 20. | 11.3 | Geometric Series and applications |
| 21. | 11.5 | Taylor series |
| 22. | 11.5 | Taylor series |

| LECTURE | SECTIONS | TOPICS |
|---------|--|---|
| 23. | 11.5 | Taylor Series |
| 24. | REVIEW | |
| 25. | TEST #2, THROUGH ASSIGNMENT FOR DAY 23 | |
| 26. | 5.1, 5.2, 5.4 | Review exponential growth/decay, $y'=k(M-y)$ |
| 27. | 5.4, 10.1 | Differential equations and solutions |
| 28. | 10.1, 10.2 | Differential equations, separation of variables |
| 29. | 10.2, 5.1, 5.4 | Separation of variables |
| 30. | 10.2 | Separation of Variables |
| 31. | 10.5 | Qualitative theory |
| 32. | 10.5, 5.4 | Qualitative theory and logistic model. |
| 33. | 10.5, 5.4 | Qualitative theory, solution for logistic model |
| 34. | 10.6 | Models |
| 35. | 10.6 | Models |
| 36. | 10.6 | Models |
| 37. | REVIEW | |
| 38. | TEST #3, THROUGH ASSIGNMENT FOR DAY 35 | |
| 39. | 10.3 | Euler's Method |
| 40. | | Predator-Prey or Logistic with Harvesting |
| 41. | REVIEW | |
| 42. | REVIEW | |
| 43. | REVIEW | |