

# MA 242: Calculus III

Syllabus for sections 002 and 004, Fall 2021, 4 credits

Welcome to Calc 3! The subject of this course is “multivariable calculus”. In earlier calculus courses you’ve taken, you have studied *functions* with an input  $x$  and output  $f(x)$  like  $f(x) = x^2$ . Multivariable calculus investigates functions with several inputs like  $g(x,y) = x^2 + y^3$  and applies the main ideas of calculus (*differentiation* and *integration*) play out in this setting. Along the way, we will learn to use three-dimensional geometry to help us understand these functions and vice versa. Simply put, multivariable calculus is calculus in 3-D!

## Teaching Staff

**Instructor of Record:** Dr. Stepan Paul -- [sspaul2@ncsu.edu](mailto:sspaul2@ncsu.edu) (he/him)

### Teaching Assistants:

- Tilekbeck Zhoroiev -- [tzhoroie@ncsu.edu](mailto:tzhoroie@ncsu.edu) (recitations 002A, 002C)
- Dave White -- [dqwhite2@ncsu.edu](mailto:dqwhite2@ncsu.edu) (recitations 002B, 002D)
- Julian Lee -- [jlee223@ncsu.edu](mailto:jlee223@ncsu.edu) (recitations 004A, 004C)
- Sean Thompson -- [sthomps6@ncsu.edu](mailto:sthomps6@ncsu.edu) (recitations 004B, 004D)

## Learning Outcomes

After taking this course, you will be able to apply the ideas of differential and integral calculus to multivariable functions, vector-valued functions, and vector fields, e.g. to find volumes and surface area, to answer multivariable optimization problems, and to calculate physical quantities like velocity, work, flux, and potential. You will learn how to work with, describe, and analyze geometric figures in three dimensions with the tools of calculus. You will see generalizations of the fundamental theorem of calculus to multivariable settings.

## Course Structure

**Lecture:** The lecture component of this course will take place Mondays, Wednesdays, and Fridays at the assigned “Lec” time slot. Lectures will take place synchronously online via Zoom. Students are expected to attend and participate in polls and group discussions and polls during the lecture time. Recordings of the lectures will be posted to Moodle. We will keep track of attendance and participation in polls, but they are not counted as part of your grade.

**Recitation:** You have also signed up for a “lab” component for this course that meets Tuesdays and Thursdays, which consists of either an in-person or synchronous online recitation at the

time you were assigned. These recitations are designed to give you practice with concepts and skills you learn in the lecture videos. You will also have a chance to ask your recitation leader questions and work together with your classmates. Recitations will be recorded and posted to the Moodle site. We will keep track of attendance, but it is not counted as part of your grade.

**WebAssign Homework:** You will have online homework assignments through WebAssign due on Wednesday and Sunday nights at 11:59pm. Please see the Moodle site for instructions on getting access to WebAssign. The approximate cost for access is \$77.50 and includes access to the textbook through the WebAssign portal. We will automatically drop your three lowest WebAssign homework assignments. WebAssign will also allow you to take a seven-day extension for 90% credit (a 10% penalty). We will drop your lowest three Webassign scores.

**Written Homework:** In addition to WebAssign homework, you will also be assigned written homework (WebAssign homework assignments have been shortened to compensate for this). The written assignments will be posted to Moodle, and you will scan and submit your solutions through Gradescope. Written assignments are due Wednesday nights at 11:59pm. Assignments received up to one day late will receive 90% credit (a 10% penalty). Some questions will be checked off for completeness and others will be graded for correctness. You will need to show your work to receive full credit. We will drop your lowest two written homework scores.

**Quizzes:** Every other Friday, you will have a 40 minute Moodle quiz during your assigned lecture time slot. For synchronous online recitation sections, the quizzes will be proctored over Zoom (you will need to have your camera on with your face visible--virtual backgrounds are okay), and you will scan and submit your solutions through Gradescope. We will drop your lowest quiz score.

**Final Exam:** The course will have a final exam during finals week, which you will take remotely. Details will be posted closer to that time. Please find the time and date for your section's final exam here: <https://studentservices.ncsu.edu/calendars/exam/#spring>

## Grading Policy

To cast your performance in the class in the best possible light, your grade for the course will be calculated as the maximum of the following grading schemes:

15% WebAssign + 15% Written Homework + 50% Quizzes + 20% Final Exam  
15% WebAssign + 15% Written Homework + 40% Quizzes + 30% Final Exam

We will use NC State's standard letter grading:

97≤ <b>A+</b> ≤100	93≤ <b>A</b> <97	90≤ <b>A-</b> <93	87≤ <b>B+</b> <90	83≤ <b>B</b> <87
80≤ <b>B-</b> <83	77≤ <b>C+</b> <80	73≤ <b>C</b> <77	70≤ <b>C-</b> <73	67≤ <b>D+</b> <70
63≤ <b>D</b> <67	60≤ <b>D-</b> <63	0≤ <b>F</b> <60		

## Policies for Late or Missed Work

If you fall behind in the course for whatever reason, you should reach out to your instructor or TA.

Your lowest three WebAssign assignments, lowest two written homeworks, and your lowest Quiz grades are automatically dropped from your grade. These drops are meant to be used for short-term illnesses or extenuating circumstances that may cause you to miss or underperform on a particular assignment or quiz. As stated above, you can also turn in WebAssign problem sets up to seven days late and written homework up to one day late for 90% credit (a 10% penalty).

For longer-term, recurring, or more serious illness or other interruptions to your participation in this class, you should reach out to your instructor or TA as soon as you can, and we will make arrangements to help you get caught up.

## Extra Help

**Your peers:** We encourage and expect you to work together with your classmates on homework assignments and studying, either remotely or in person.

**Zoom homework meet-ups:** On Moodle you will find links to homework meetup groups. These are Zoom meetings dedicated to allowing you as students to find others working on the same homework assignments and material. No appointment is necessary. Teaching staff will not necessarily be present.

**Piazza:** On Moodle, you will find a link to the Piazza page for this course. This allows you to ask and answer questions that you have about the homework/material. The teaching staff will also monitor discussions, providing help with questions, and “certifying” correct responses. Note that your posts will be anonymous to your classmates, but instructors will see your identity.

**Office hours:** The [office hours schedule](#) (also on Moodle) gives a list of the teaching staff’s office hours. We are all on the same schedule, so you should feel free to stop by any of our office hours. No appointment is necessary. You can ask questions about the homework, or general questions about course material.

# Academic Integrity

On WebAssign and written homework, we encourage you to work together with your peers and seek help from the teaching staff, textbook, and other resources as needed. However, you should make sure you understand the solutions you submit.

On Quizzes and the Final Exam, you may **not** work with anyone else nor seek outside help--collaboration is strictly prohibited unless otherwise specified. Each assessment will have instructions outlining exactly what resources or electronic aides you are permitted to use.

Posting course materials to websites like Chegg and Course Hero is a violation of copyright law and course policy and is strictly prohibited. Violations of this policy will be reported to the Office of Student Conduct.

You are expected to abide by the Code of Student Conduct ([NCSU POL11.35.01](#)) and Pack Pledge. Violations of academic integrity will be handled in accordance with the Student Discipline Procedures ([NCSU REG 11.35.02](#)). Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

# Course Schedule

The following rough schedule is tentative and subject to change.

<b>Week 1</b>	$\mathbf{R}^2$ , $\mathbf{R}^3$ , and vector arithmetic
<b>Week 2</b>	Dot product and cross product
<b>Week 3</b>	Lines and planes & vector-valued functions, <b>Quiz 1</b>
<b>Week 4</b>	Vector-valued functions, tangent vectors and arc length, multivariable functions
<b>Week 5</b>	Equations in $\mathbf{R}^3$ , partial derivatives, <b>Quiz 2</b>
<b>Week 6</b>	Linearization, chain rule, gradient, tangent planes
<b>Week 7</b>	Optimization, <b>Quiz 3</b>
<b>Week 8</b>	Optimization, double integrals
<b>Week 9</b>	Double integrals, triple integrals, <b>Quiz 4</b>
<b>Week 10</b>	Double integrals in polar coordinates, triple integrals in spherical coordinates
<b>Week 11</b>	Vector fields, div and curl line integrals, <b>Quiz 5</b>
<b>Week 12</b>	Conservativeness, FTLI, parameterizing surfaces

<b>Week 13</b>	Surface area, scalar surface integrals, flux
<b>Week 14</b>	Green's Theorem, Stokes' Theorem, <b>Quiz 6</b>
<b>Week 15</b>	Stokes' Theorem, Divergence Theorem

For a day-by-day schedule, see the course calendar on Moodle.

## Additional Information

**Course catalog description:** Third of three semesters in a calculus sequence for science and engineering majors. Vectors, vector algebra, and vector functions. Functions of several variables, partial derivatives, gradients, directional derivatives, maxima and minima. Multiple integration. Line and surface integrals, Green's Theorem, Divergence Theorems, Stokes' Theorem, and applications. Use of computational tools. Prerequisite: MA 241 with grade of C- or better or AP Calculus credit, or Higher Level IB credit.

**Requirements for Credit-Only (S/U) Grading:** In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to <http://policies.ncsu.edu/regulation/reg-02-20-15>.

**Requirements for Auditors (AU):** Information about and requirements for auditing a course can be found at <http://policies.ncsu.edu/regulation/reg-02-20-04>.

**Policies on Incomplete Grades:** If an extended deadline is not authorized by the instructor or department, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at <http://policies.ncsu.edu/regulation/reg-02-50-3>.

**Attendance Policy:** For complete attendance and excused absence policies, please see <http://policies.ncsu.edu/regulation/reg-02-20-03>

**Digital Course Components:** Students may be required to disclose personally identifiable information to other students in the course, via digital tools, such as email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course. The following digital components will be used: Zoom, Moodle, Piazza, Gradescope.

**Accommodations for Disabilities:** Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, Campus Box 7509, 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 (REG02.20.01) (<https://policies.ncsu.edu/regulation/reg-02-20-01/>).

**Non-discrimination Policy:** NC State provides equal opportunity and affirmative action efforts, and prohibits all forms of unlawful discrimination, harassment, and retaliation ("Prohibited Conduct") that are based upon a person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability, gender identity, genetic information, sexual orientation, or veteran status (individually and collectively, "Protected Status"). Additional information as to each Protected Status is included in NCSU REG 04.25.02 (Discrimination, Harassment and Retaliation Complaint Procedure). NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or <https://oied.ncsu.edu/divweb/>. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

**Additional NC State Rules and Regulations:** Students are responsible for reviewing the NC State University Policies, Rules, and Regulations (PRRs) which pertain to their course rights and responsibilities, including those referenced both below and above in this syllabus:

- Equal Opportunity and Non-Discrimination Policy Statement <https://policies.ncsu.edu/policy/pol-04-25-05> with additional references at <https://oied.ncsu.edu/divweb/policies/>
- Code of Student Conduct <https://policies.ncsu.edu/policy/pol-11-35-01>.

## COVID Addendum

Due to the Coronavirus pandemic, public health measures have been implemented across campus. Students should stay current with these practices and expectations through the [Protect the Pack](https://www.ncsu.edu/coronavirus/) website (<https://www.ncsu.edu/coronavirus/>). The sections below provide expectations and conduct related to COVID-19 issues.

### Health and Participation in Class

We are most concerned about your health and the health of your classmates and instructors/TAs.

- If you test positive for COVID-19, or are told by a healthcare provider that you are presumed positive for the virus, please work with your instructor on health accommodations and follow other university guidelines, including self reporting ([Coronavirus Self Reporting](#)): Self-reporting is not only to help provide support to you, but also to assist in contact tracing for containing the spread of the virus.

- If you feel unwell, even if you have not been knowingly exposed to COVID-19, please do not come to class.
- If you are in quarantine, have been notified that you may have been exposed to COVID-19, or have a personal or family situation related to COVID-19 that prevents you from attending this course in person (or synchronously), please connect with your instructor to discuss the situation and make alternative plans, as necessary.
- If you need to make a request for an academic consideration related to COVID-19, such as a discussion about possible options for remote learning, please talk with your instructor for the appropriate process to make a COVID-19 request (a university-level form can be found [here](#)).

### Health and Well-Being Resources

These are difficult times, and academic and personal stress are natural results. Everyone is encouraged to [take care of themselves](#) and their peers. If you need additional support, there are many resources on campus to help you:

- Counseling Center ([NCSU Counseling Center](#))
- Health Center ([Health Services | Student](#))
- If the personal behavior of a classmate concerns or worries you, either for the classmate's well-being or yours, we encourage you to report this behavior to the NC State CARES team: ([Share a Concern](#)).
- If you or someone you know are experiencing food, housing or financial insecurity, please see the Pack Essentials Program ([Pack Essentials](#)).

### Community Standards related to COVID-19

We are all responsible for protecting ourselves and our community. Please see the [community standards](#) (released on 7/28/2020) and Rule 04.21.01 regarding Personal Safety Requirements Related to COVID-19 [RUL 04.21.01 – Personal Safety Requirements Related to COVID-19 – Policies, Regulations & Rules](#).

### Course Expectations Related to COVID-19:

- **Face Coverings:** All members of the NC State academic community are required to follow all university guidelines for personal safety with face coverings, physical distancing, and sanitation. Face coverings are required in class and in all NC State buildings. Face coverings should be worn to cover the nose and mouth and be close fitting to the face with minimal gaps on the sides. In addition, students are responsible for keeping their course/work area clean. Please follow the cleaning guidelines described by the university.
- **Course Attendance:** NC State attendance policies can be found at: [REG 02.20.03 – Attendance Regulations – Policies, Regulations & Rules](#) . Please refer to the course's attendance, absence, and deadline policies for additional details. If you are quarantined or otherwise need to miss class because you have been advised that you may have been exposed to COVID-19, you should not be penalized regarding attendance or class participation. However, you will be expected to develop a plan to keep up with your coursework during any such absences. If you become ill with COVID-19, you should follow the steps outlined in the health and participation section above. COVID 19-related

absences will be considered excused; documentation need only involve communication with your instructor.

- **Course Meeting Schedule:** Your course might not have a traditional meeting schedule in Fall 2020. Be sure to pay attention to any updates to the course schedule as the information in this syllabus may have changed. Please discuss any questions you have with the instructor.
- **Classroom Seating:** To support efficient, effective contact tracing, please sit in the same seat when possible and take note of who is sitting around you; instructors may also assign seats for this purpose.
- **Technology Requirements:** This course may require particular technologies to complete coursework. Be sure to review the syllabus for these expectations, and see the [syllabus technology requirements](#) for your course. If you need access to additional technological support, please contact the Libraries' Technology Lending Service: ([Technology Lending](#)).

### **Course Delivery Changes Related to COVID-19**

Please be aware that the situation regarding COVID-19 is frequently changing, and the delivery mode of this course may need to change accordingly, including from in-person to online. Regardless of the delivery method, we will strive to provide a high-quality learning experience.

### **Grading/Scheduling Changing Options Related to COVID-19**

If the delivery mode has a negative impact on your academic performance in this course, the university has provided tools to potentially reduce the impact:

- **Enhanced S/U Grading Option:** [Enhanced Satisfactory/ Unsatisfactory Grading Option](#)
- **Late Drop:** [Enhanced Late Drop Option](#)

In some cases, another option may be to request an incomplete in the course. Before using any of these tools, discuss the options with your instructor and your academic advisor. Be aware that if you use the enhanced S/U, you will still need to complete the course and receive at least a C- to pass the course.

### **Other Important Resources**

- **Keep Learning:** [Keep Learning](#)
- **Protect the Pack FAQs:** [Frequently Asked Questions | Protect the Pack](#)
- **NC State Protect the Pack Resources for Students:** [Resources for Students | Protect the Pack](#)
- **NC State Keep Learning, tips for students opting to take courses remotely:** [Keep Learning Tips for Remote Learning](#)
- **Introduction to Zoom for students:** <https://youtu.be/5LbPzzPbYEW>
- **Learning with Moodle, a student's guide to using Moodle:** <https://moodle-projects.wolfware.ncsu.edu/course/view.php?id=226>
- **NC State Libraries** [Technology Lending Program](#)



