FLORIDA POLYTECHNIC UNIVERSITY

Analytic Geometry and Calculus III

SPRING 2026

Course Information

- **Course Number and Title**: MAC 2313-02: Analytic Geometry and Calculus III
- **Credit Hours:** 4
- **Academic Term:** Spring 2026

Instructor Information

- **Instructor:** Adam Rumpf, Ph.D.
- **Office Location:** IST 2008
- **Office Hours**: MWF 12:00-1:00pm, TWF 2:00-3:00pm, or by appointment
- **Email address**: arumpf@floridapoly.edu

Course Delivery and Course Description

- **Delivery Mode**: MTWF 1:00-1:50pm, IST 1003 (Face to Face)
- **Course Website**: Canvas course site
- **Official Catalog Course Description**: This course covers solid analytic geometry, vectors, partial derivatives, and multiple integrals.
    - **Course Pre and/or Co-Requisites**: Letter grade of C or higher in MAC 2312
    - **Communication/Computation Skills Requirement (6A-10.030): N**
- **Required Texts and Materials:**
- OpenStax Calculus Volume 3 (free E-book)
  Gilbert Strang and Edwin Herman
  https://openstax.org/details/books/calculus-volume-3
  ISBN-13: 978-1-947172-16-6
- https://edfinity.com: For online homework (See instructions below)
- **Equipment and Materials**: Electronic devices such as laptops and cell phones are recommended for use in class but will *not* be permitted on exams. Calculators may be permitted on portions of certain exams.

Course Objectives and Outcomes

- **Course Objectives**: Master the concepts of vectors and geometry in three-dimensional Euclidean space, study vector-valued functions in two and three dimensions and understand motion in space, learn how to interpret and apply partial derivatives, learn how to interpret, and apply multiple integrals, and understand line integrals and vector fields leading up to Green's Theorem.

- **Course Learning Outcomes**: The following topics will be used to measure the student learning outcome "Demonstrate fluency in mathematics concepts", which corresponds to the Mathematics Reasoning Competency:
    - CLO 1: Perform basic arithmetic and algebraic operations with vectors. Interpret these operations geometrically and determine how to appropriately apply them.
    - CLO 2: Compute derivatives and integrals of vector-valued functions and use them to solve geometric and kinematic problems.
    - CLO 3: Compute differential operations for scalar fields. Interpret these operations graphically and as rates of change, and apply them to solve problems involving scalar fields.
    - CLO 4: Set up and evaluate double or triple integrals for scalar fields in rectangular and other coordinate systems. Apply these to compute physical quantities.
    - CLO 5: Set up and evaluate a line integral or surface integral of a scalar or vector field.

  Additionally, students will:

  Illustrate and solve mathematical problems by using computers.
  Clearly communicate solutions to multi-step mathematics problems through careful, organized, and well-annotated work.
  Effectively write mathematical solutions in a clear and concise manner.
- **Course Standards:** The following is a list of 27 "standards", grouped according to the course learning outcome they support. These represent the specific tasks which will be evaluated on quizzes and exams. The 10 standards marked with a star (*) are the "core standards", which must all be met to earn a passing grade. (See the Grading Scale and Assignment/Evaluation Methods sections below for details.)
    - Standard 1a.* (Vector Magnitudes) Compute the magnitude of a vector, and demonstrate a geometric understanding of what a magnitude represents.
    - Standard 1b.* (Dot Products) Compute the dot product of two vectors, and demonstrate a geometric understanding of what a dot product represents.
    - Standard 1c. (Projections and Components) Compute the scalar or vector projection of one vector onto another, and demonstrate a geometric understanding of what projections and components represent.
    - Standard 1d.* (Cross Products) Compute the cross product of two vectors, and demonstrate a geometric understanding of what a cross product represents.
    - Standard 1e. (Equations of Lines and Planes) Find an equation of a line, line segment, or plane satisfying a given list of properties.
    - Standard 2a.* (Vector-Valued Basic Calculus Operations) Evaluate basic calculus operations for a vector-valued function, including: limits, derivatives, and definite and indefinite integrals.
    - Standard 2b.* (Tangent and Normal Vectors) Compute the tangent vector, unit tangent vector, unit normal vector, unit binormal vector, and tangent line of a space curve at a given point, and demonstrate a geometric understanding of what they represent.
    - Standard 2c. (Arc Length) Set up and/or evaluate a definite integral to compute the arc length of a given space curve.
    - Standard 2d. (Curvature) Compute the curvature of a given space curve at a given point, and demonstrate a geometric understanding of what curvature represents.

- Standard 3a. (Interpreting Contour Plots and Surfaces) Apply a contour plot or an image of a surface to determine important features of a given function of two variables.
- Standard 3b.* (Partial Derivatives) Evaluate a partial derivative of a scalar field and interpret what the result means, both graphically and as a rate of change.
- Standard 3c. (Linearization and the Total Differential) Compute the linearization and/or the total differential of a multivariate function centered at a given point, and demonstrate an understanding of what multivariate linearization and differentials are used for.
- Standard 3d. (Directional Derivatives) Compute the directional derivative of a scalar field in a given direction at a given point and demonstrate an understanding of what it represents, both geometrically and as a rate of change.
- Standard 3e.* (The Gradient) Compute the gradient of a scalar field at a given point and demonstrate an understanding of the significant properties of the direction and magnitude of the gradient as they relate to directional derivatives and level curves.
- Standard 3f. (Critical Points and Local Extrema) Find and classify the critical points of a scalar field, and demonstrate a geometric understanding of what a local maximum, local minimum, and a saddle point are. Apply these definitions to solve a multivariate optimization problem.
- Standard 3g. (Lagrange Multipliers) Solve a constrained optimization problem by applying the method of Lagrange multipliers. Apply the optimal Lagrange multipliers from a constrained optimization problem to approximate how changes in the constraints affect the objective.
- Standard 4a.* (Double Integrals) Set up and/or evaluate a double integral or a Riemann sum to accumulate a function over a two dimensional area.
- Standard 4b. (Polar Coordinates) Set up and/or evaluate a double integral using polar coordinates as appropriate.
- Standard 4c. (Triple Integrals) Set up and/or evaluate a triple integral or a Riemann sum to accumulate a function over a three dimensional volume.
- Standard 4d. (Cylindrical and Spherical Coordinates) Set up and/or evaluate a triple integral using cylindrical or spherical coordinates as appropriate.
- Standard 5a. (Scalar Line Integrals) Set up and/or evaluate a line integral to accumulate a scalar field along a curve, and demonstrate a physical understanding of the result.
- Standard 5b.* (Vector Line Integrals) Set up and/or evaluate a line integral to accumulate a vector field along a curve or the flux of a vector field across a curve, and demonstrate a graphical and physical understanding of the result.
- Standard 5c. (The Fundamental Theorem for Line Integrals) Apply the Fundamental Theorem for Line Integrals as appropriate to evaluate a line integral.
- Standard 5d. (Divergence and Curl) Compute the divergence and curl of a vector field, and demonstrate a graphical understanding of what each represents.
- Standard 5e.* (Green's Theorem) Apply Green's Theorem as appropriate to evaluate a circulation or flux integral. Demonstrate an understanding of how both versions of Green's Theorem are related to divergence and curl.
- Standard 5f. (Scalar Surface Integrals) Compute the surface integral of a scalar field, and demonstrate a physical understanding of the result.

- Standard 5g. (Vector Surface Integrals) Compute the surface integral of a vector field, and demonstrate a physical understanding of the result.

Course Policies

Attendance

- Students are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP).
- A+ attendance is used to record the attendance of students. Students are expected to have a unique code given by the instructor. Please do not email if you forget to put code in the classroom. Failure to put code will mark as absent.

Participation

Students are expected to participate in the classroom experience. The use of earbuds, headphones, or any other unauthorized technology during class is specifically not allowed and students who engage in this behavior may be marked as absent and/or asked to leave the class for the day (noting exceptions for authorized accommodations). Persistent problems with participation may result in a code of conduct referral.

Late Work/Make-up work

Make-up exams and quizzes will be permitted *only* for excused absences with appropriate written documentation. If possible, notification *should* be given beforehand so that alternate arrangements can be made.

Likewise, unexcused late homework submissions will not be accepted for any reason, including due to technical errors with submission through Canvas, so be sure to submit early to avoid unexpected delays. If you are unable to submit your work through Canvas on time, email what you have to your instructor *immediately* to demonstrate that you've made a good-faith effort to complete the assignment as requested. Exceptions and extensions may be permitted on a case-by-case basis.

Grading Scale

This course uses a **standards grading** system. Each of the 27 **standards** listed above will appear on a total of four in-class assessments: a **quiz**, a **midterm exam**, a midterm exam **make-up**, and a cumulative **final exam**. A standard counts as being "met" when it is successfully demonstrated on at least *two* of these four assessments, and final letter grades will primarily depend on the number of standards met (twice) by the end of the semester. Meeting a standard only once grants no credit.

The 10 **core standards** indicated by a star (*) above are considered to be particularly important for the later parts of this course and for successor courses. In addition to counting towards the 27 total standards, *all* 10 must be met to earn a passing grade of C or better.

Additionally, a total of 28 **homework assignments** will be collected throughout the semester, consisting of a combination of online homework submitted through Edfinity and hand-written homework uploaded to Canvas. Final letter grades are also partially dependent on the number of homework assignments submitted.

The table below shows the scores required in each of these three categories to achieve each letter grade. Achieving the letter grade in a column requires meeting *all* cutoffs listed beneath it (e.g. achieving an A requires meeting at least 23/27 standards, including all 10/10 core standards, and submitting at least 22/28 homework assignments).

Category	**D**	**C**	**B**	**A**
Standards: Total number of standards (including core standards) met on two separate assessments.	13/27	17/27	20/27	23/27
Core Standards: Total number of core standards met on two separate assessments.	7/10	10/10	10/10	10/10
Homework: Total number of homework assignments (including both hand-written and Edfinity) completed.		14/28	18/28	22/28

In addition, attendance will be used to modify certain letter grades to plus/minus grades according to the following table.

	Minus (-)	**Plus (+)**
Unexcused Absences	8 or more	4 or fewer

Note that not all letter grades can be modified by a plus or minus. In particular, D and F grades are never modified by a plus or minus, C grades can never be decreased to C-, and A grades can never be increased to A+.

Example Grade

Alice met 21/27 standards on at least two assessments, including all 10 core standards, and submitted 26/28 homework assignments. Her overall letter grade is a B, since she reached all B level cutoffs but not all A level cutoffs.

If, in addition, Alice ended the semester with 4 or fewer unexcused absences, her grade would be B+. If she had between 4 and 8 unexcused absences, it would remain a B. If she had 8 or more unexcused absences, it would be B-.

Assignment/Evaluation Methods

Quizzes, Exams, and Retakes

The 27 standards explained above will appear on proctored in-class assessments throughout the semester. Each standard will appear on a total of four assessments, which include (in order): a quiz, a midterm exam, a midterm exam retake opportunity, and a cumulative final exam.

Each quiz and exam question will be graded using a holistic score of **M, R, or N**:

- M – Meets Expectations. This score indicates that the solution is completely correct and well-presented.
- R – Resubmit. This score indicates that the solution is mostly correct and displays an understanding of the standard, but contains minor mistakes not directly related to the standard being tested (e.g. arithmetic errors, algebraic errors, lack of detail, or incorrect notation). A score of R does not count as meeting the standard, but the solution may be resubmitted with corrections within a limited time frame to upgrade the score to an M.
- N – Not Yet. This score indicates that the solution illustrates fundamental gaps in mastery of the standard.

Only an "M" score counts as a successful demonstration of the standard; there is no partial credit. A standard counts as being "met" for the purposes of the gradebook if and only if an "M" score has been achieved for at least *two* of its four quiz/exam appearances.

Assessments will be returned after grading to inform students of which solutions they may need to resubmit (due to an R grade) and which standards they may need to make up on the upcoming retake opportunities. Due to the increased importance and stakes of the core standards, additional reassessment opportunities beyond the midterm retake and final exam may be offered.

Credit for meeting a standard can never be lost after it is gained, so once a student meets a standard twice they may simply skip that standard's questions on all future assessments. For this reason, the midterm exam retakes and cumulative final exam are both optional, though it is strongly recommended that students missing some standards take advantage of all retake opportunities available to them.

Homework

Homework will be assigned through Canvas weekly. Each homework will consist of two separate assignments:

- An **online** assignment, to be completed through an online homework system called Edfinity (details for enrolling in this service can be found on the course Canvas site).
- A **hand-written** assignment, to be completed by hand, scanned, and uploaded to Canvas as a single PDF.

Both of these assignments count separately towards the overall homework total in the gradebook. There will be a total of 14 weekly homework assignments, each with an Edfinity part

and a hand-written part, which combine to make up the total of 28 homework assignments listed in the grade table above.

The purpose of homework is to act as a learning experience and to offer an opportunity to practice working with the concepts covered in class before seeing them on quizzes and exams. For this reason, all homework assignments will be graded solely for completion and feedback, with the Edfinity assignments offering instant feedback to immediately indicate any mistakes made, and with the hand-written homework assignments offering feedback from the grader regarding correctness of approach and presentation.

Full credit will be earned for submitting an assignment on time and making a good-faith effort to complete all problems and to present professional work. Late work will not be accepted.

Attendance

Attending class, taking notes, and working through in-class exercises is essential for success in any course. Attendance will be taken daily except on exam/retake days, and will be used to modify certain letter grades with a plus or minus as explained above.

Earning attendance credit requires arriving on time and being prepared to learn. A student may be marked as absent for the day for arriving late, leaving early, for unauthorized use of technology (notably earbuds, laptops, and cell phones) or material unrelated to this class, or for a blatant lack of engagement. Absences may be excused on a case-by-case basis as long as a good-faith effort is made to ask for permission ahead of time or to inform the instructor as soon as possible in case of emergency.

Course Schedule (Subject to Change)

Important Dates: https://floridapoly.edu/academics/academic-calendar/index.php

Quiz and exam dates, as well as the topic schedule, are subject to change. Refer to the course canvas page regarding quizzes and exams the Academic Calendar website for the most up-to-date final exam schedule.

Week	Topics	Notes and Important Dates
1 **Jan 12 – Jan 16**	2.1 Vectors in the Plane 2.2 Vectors in Three Dimensions 2.3 The Dot Product Standards: 1a*, 1b*, 1c	Mon Jan 12: First day of Class
2 **Jan 19 – Jan 23**	2.4 The Cross Product 2.5 Equations of Lines and Planes in Space Standards: 1d*, 1e	**Mon Jan 19: Martin Luther King Jr. Day (no classes)** **Fri Jan 23: Quiz 1 (Std 1a—1d)**
3 **Jan 26 – Jan 30**	2.5 cont'd 3.1 Vector-Valued Functions and Space Curves 3.2 Calculus of Vector-Valued Functions 3.3 Arc Length and Curvature Standards: 1e, 2a*, 2b*, 2c	
4 **Feb 2 – Feb 6**	3.3 cont'd 4.1 Functions of Several Variables Standards: 2c, 2d, 3a	**Wed Feb 4: Quiz 2 (Std 1e, 2a—2d)** **Fri Feb 6: Exam 1 (Std 1a—1e, 2a—2d)**
5 **Feb 9 – Feb 13**	4.3 Partial Derivatives Standards: 3b*	**Tue Feb 10: Career Day (no classes)** **Fri Feb 13: Exam 1 Retake**
6 **Feb 16 – Feb 20**	4.3 cont'd 4.4 Tangent Planes and Linear Approximations 4.6 Directional Derivatives and the Gradient Standards: 3b*, 3c, 3d	**Fri Feb 20: Quiz 3 (Std 3a—3c)**
7 **Feb 23 – Feb 27**	4.6 cont'd 4.7 Maxima/Minima Problems Standards: 3d, 3e*, 3f	
8 **Mar 2 – Mar 6**	4.7 cont'd 4.8 Lagrange Multipliers 5.1 Double Integrals over Rectangles	**Tue Mar 3: Quiz 4 (Std 3d—3f)**

	5.2 Double Integrals over General Regions Standards: 3f, 3g, 4a*	
9 **Mar 9 – Mar 13**	5.2 cont'd 5.3 Double Integrals in Polar Coordinates Standards: 4a*, 4b	**Wed Mar 11: Quiz 5 (Std 4g, 4a—4b)** **Fri Mar 13: Exam 2 (Std 3a—3g, 4a—4b)**
10 **Mar 16 – Mar 20**	**Spring Break**	**Mon Mar 16 – Fri Mar 20: Spring Break (no classes)**
11 **Mar 23 – Mar 27**	5.4 Triple Integrals 5.5 Triple Integrals in Cylindrical and Spherical Coordinates Standards: 4c, 4d	**Fri Mar 27: Exam 2 Retake**
12 **Mar 30 – Apr 3**	5.5 cont'd 6.1 Vector Fields 6.2 Line Integrals Standards: 4d, 5a, 5b*	**Fri Apr 3: Quiz 6 (Std 4c—4d, 5a)**
13 **Apr 6 – Apr 10**	6.2 cont'd 6.3 Conservative Vector Fields 6.5 Divergence and Curl Standards: 5b*, 5c, 5d	
14 **Apr 13 – Apr 17**	6.4 Green's Theorem 6.6 Surface Integrals Standards: 5e*, 5f	**Fri Apr 17: Quiz 7 (Std 5b—5e)**
15 **Apr 20 – Apr 24**	6.6 cont'd 6.7 Stokes' Theorem Standards: 5g	**Tue Apr 21: Quiz 8 (Std 5f—5g)** **Wed Apr 22: Exam 3 (Std 4c—4d, 5a—5g)**
16 **Apr 27 – May 1**	6.8 The Divergence Theorem	**Tue Apr 28: Exam 3 Retake** Tue Apr 28: Last Day of Class Wed Apr 29 – Fri May 1: Reading Days (no classes) **Date TBD: Final Exam (cumulative)**

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center**: The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).
    - **Knack Tutoring**: Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit https://floridapolytechnic.libguides.com/writingservices

Civility and Collegiality

Faculty and students come to the university for the same reason, which is to participate in a highly professional educational environment. To that end, both students and faculty are expected to treat each other with mutual regard and civility. In more general terms, collegiality means respecting the right of both faculty and students to participate fully and fairly in the educational enterprise.

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations. If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal, and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive. If you are not registered with

ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu; (863) 874-8770; https://floridapoly.edu/studentlife/disability-services

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discuss resources and options available.

Academic Integrity

Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). *Recording class activities including, but not limited to, lab sessions, student presentations (whether individually*

or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is ***prohibited****.*