

**Instructor:** Vance Blankers  
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**Office Hours:** 4:30pm – 5:30pm T, 12pm – 1pm W, 8am-9am F  
**Class Meetings:** 4:35pm – 5:40pm MWR, Richards Hall 165

**Course Description:** This course covers techniques of integration, improper integrals, polynomial approximations of functions, power series representations of functions, sequences, convergence tests for series, the dot product and orthogonal projections in Euclidean space and the cross product in three space. Applications include distance traveled in space, volume, mass and density, work, and equations for lines and hyperplanes in space.

**Course Learning Objectives:** At the end of the course students will be able to

- Find indefinite integrals of functions by selecting and then using techniques of integration,
- Find power series approximations of a function and give bounds on the error,
- Select among tests for convergence to determine whether a series of numbers converges
- Find the interval of convergence for a power series,
- Compute volumes and mass,
- Find the angle between vectors in space,
- Find equations of lines and hyperplanes in space, and
- Clearly present their reasoning and the steps in their solutions to problems

**Course Website:** Canvas will be your hub for information about the course. It is your responsibility to check Canvas often and keep up with course announcements and assignments posted in the weekly modules.

**Textbooks:** *Worldwide Integral Calculus, with infinite series* and *Worldwide Multivariable Calculus*, by David B. Massey.

PDF and printed versions are available at <http://www.centerofmath.org/store/>

The PDF textbooks have hyperlinked Tables of Contents, Indices, and cross-references. You may need to activate the Forward and Back buttons in your PDF viewer to take full advantage of the hyperlinks. To use the textbook on an iPad, we recommend the GoodReader app. It is absolutely **NOT** required that you purchase a printed textbook.

The PDF textbook contains links at the beginning of each section to online full-length, free, video lectures on the contents of that section. These videos can also be accessed by going to <https://www.youtube.com/user/CenterofMath/> In addition, the PDF textbook has links to videos of solutions for selected exercises. If there is a discrepancy between how the videos present material and how your instructor presents material, you should follow your instructor's presentation, but you should discuss the matter with your instructor.

**Quizzes:** We will typically have an in-class **quiz** each week. There will be **no make-up** quizzes; instead, I will drop the two lowest quiz scores. A missed quiz will be counted in the dropped lowest score. There may be exceptions to this policy for students due to their participation in university sponsored activities. Students should confer with me about such circumstances as far in advance as possible.

**Hour Tests:** We will have **two in-class 65-minute tests** during the semester: one on Thursday, **October 6** and the second on Thursday, **November 10**. In the rare event that a student misses one of these tests due to a university sanctioned absence or religious observances, the student will be given a makeup test. If a student misses a test for some other reason, then at the instructor's discretion, the student may be given a makeup test. A student's grade on the final exam will not be used in place of a poor grade on a 65-minute test or in place of a missed 65-minute test.

**Final Exam:** The common final exam is cumulative and will be weighted as 40% of the overall course average. All students without legitimate conflicts approved by the registrar must take the final exam at the scheduled time (TBD). Two finals at the same time or three exams in one day are the only University recognized legitimate reasons to be excused from taking the final at the scheduled time. Students with such a conflict must complete a final exam conflict form, available on the registrar's website. Final exam conflicts must be resolved in advance with the Registrar's Office and your instructor. The last day to file a Final Exam Conflict Form with the registrar is September 30th. **Do not make travel plans that conflict with the final exam.** There is no make-up for the final. If you miss the final, it will count as a 0 and you will fail the course.

<b>Grading:</b>	Final Exam:	40%
	65 min tests:	40% (20% each)
	Quizzes:	20%

Letter grades are determined from the numerical grades as follows:

A: 93-100,	A-: 90-92,	B+: 87-89,	B: 83-86,	B-: 80-82,	C+: 77-79,
C: 73-76,	C-: 70-72,	D+: 67-69,	D: 63-66,	D-: 60-62,	F: 0- 59

Border line grades are determined by the final exam score.

**Incomplete Grade:** As a matter of Math Department policy, the I grade (incomplete) will be given only rarely. It is intended to cover real emergency situations in which a student who is doing reasonably well (C- or better) is unable, due to circumstances beyond the student's control, to complete all course requirements (e.g., is unable to take the final exam due to hospitalization). An I grade may not be used to rescue a failing grade or to postpone the final.

**Homework:** Homework will be assigned daily. No homework will be collected. Although homework will not be collected, all quizzes and tests will be based on the homework problems. Therefore, it is essential that you do all the homework. We will not be able to go over all homework problems in class, and even those that we do go over may not get worked out completely. Therefore, if you have a lot of questions on the homework, it will be essential for you to connect with me during my office hours or make special appointments. It is very helpful to work on the homework in groups.

**Attendance:** You are expected to participate in class each day. The course moves quickly. You can fall behind in a single day. If you miss class for any reason, I would appreciate your letting me know by e-mail your reason for missing class.

**Free Tutoring:** The Peer Tutoring Program (PTP) provides free tutoring. Students can sign up for tutoring sessions via their studenthub. The College of Engineering provides free tutoring in Calculus for students in the College of Engineering. See <http://www.coe.neu.edu/undergraduate-support/tutoring> . The College of Science Tutoring Center is located in 416 Richards Hall. The hours are Mon-Thurs 4:30pm – 9:00pm. The center is staffed by upper class undergraduate students who hold drop-in hours, as well as Undergraduate Teaching Fellows who organize review sessions for specific courses.

**Additional videos:** In addition to the video lectures and video solutions to selected problems that come with the texts there are publicly available videos of lectures by Professors Elizabeth Wilson and Valerie Hower. The videos by Elizabeth Wilson are available at

<https://www.youtube.com/channel/UCSDFrMRT8DT-TptgWTXkZtg>

The link takes you to the main page where you can select "playlists". The playlists are named, and there are two for Calculus 2, one is for Lectures and the other is for Examples.

The videos by Valerie Hower are available at

<https://www.youtube.com/playlist?list=PLpcwHaLYiaEWLlEdH2gpK2J7gTAXzB5N>

and Examples (which are typically homework problems in the text) at:

<https://www.youtube.com/playlist?list=PLpcwHaLYiaEUD0oXF6GqdL8Y36Jn4UTce>

**Issues with the Course/Instructor:** If you have issues with this course or instructor which you are not able to resolve through conversation with your instructor, contact the course coordinator, Richard Porter at [r.porter@northeastern.edu](mailto:r.porter@northeastern.edu). For matters that remain unresolved, you can contact the Teaching Director, Professor Alex Martsinkovsky, [a.martsinkovsky@northeastern.edu](mailto:a.martsinkovsky@northeastern.edu).

**Academic Honesty:** Cheating will not be tolerated. All incidents of cheating will be reported to the Office of Judicial Affairs. The University's policy on cheating and related disciplinary actions are detailed in the Student Handbook and at the following web site (see <http://www.northeastern.edu/osccr/academicintegrity>).

**Calculators and Cell phones:** You should have a graphing calculator. A TI-83 Plus or higher is sufficient. Calculators may be used during class and on some quizzes and tests with the permission of your instructor. Cell phones must be turned off during class. Calculators will be allowed on the final exam.

### **Some Important Dates:**

**September 27** is the last day to drop a class without a W grade.

**September 30** is the last day to file a Final Exam Conflict Form.

**December 8** is the last day to drop a class with a W grade

## **Schedule of Topics and Suggested Homework Exercises**

### **Week 1: September 7 – 9**

§1.1 Recall anti-derivatives #2, 3, 5, 7, 9, 11, 15, 19, 23, 26

§1.1 Integration by Parts #32, 33, 34, 36, 37, 39, 41

**Week 2: September 12 – 16**

§1.3 Integration by Partial Fractions (1<sup>st</sup> day) #1, 3, 7, 9, 11-14

§1.3 Integration by Partial Fractions (2<sup>nd</sup> day) #1, 3, 7, 9, 11-14

§2.5 Improper Integrals #1, 4, 5, 9-11

**Quiz 1****Week 3: September 19 – 23**

§2.6 Numerical Techniques #1, 20, 23, 25, 26

§4.1 Approximating Polynomials #1-3, 7-11, 15, 16, 20

§4.2 Approximation of Functions (1<sup>st</sup> day) #1-3, 6, 9, 11, 16, 19-21, 23, 32

**Quiz 2****Week 4: September 26 – 30**

§4.2 Approximation of Functions (2<sup>nd</sup> day) #1-3, 6, 9, 11, 16, 19-21, 23, 32

§4.3 Error in Approximation (1<sup>st</sup> day) #1, 2, 5, 13, 21

§4.3 Error in Approximation (2<sup>nd</sup> day) #1, 2, 5, 13, 21

**Quiz 3****Week 5: October 3 – 7**

§4.4 Functions as Power Series #1-3, 5, 7, 11, 13, 15

§4.6 Power Series as Functions II #11, 12, 13, 14, 16-18, 35-37, 40, 42

Review & **Hour Test 1**

**Week 6 (partial): October 10 – 14**

§5.1 Theorems on Sequences #1-9, 17, 19, 20, 27, 28, 30

§5.2 Basic Theorems on Series #1-5, 11-13, 21-26, 31-33, 45, 47, 51, 52, 55

**Monday, October 10, Indigenous Peoples Day, no classes**

**Week 7: October 17 – 21**

§5.3 Non-negative Series (1<sup>st</sup> day) #2-7, 11-13, 17, 19, 22-25, 27, 29, 31, 33, 35, 38, 40, 42

§5.3 Non-negative Series (2<sup>nd</sup> day) #2-7, 11-13, 17, 19, 22-25, 27, 29, 31, 33, 35, 38, 40, 42

§5.4 Series with Positive and Negative Terms (1<sup>st</sup> day) #1-5, 9, 10, 13, 15, 21, 22, 33-36, 42

**Quiz 4****Week 8: October 24 – 28**

§5.4 Series with Positive and Negative Terms (2<sup>nd</sup> day) #1-5, 9, 10, 13, 15, 21, 22, 33-36, 42

§4.5 Power Series as Functions I #1-3, 7, 9-11, 13, 14, 16, 17

§3.1 Displacement and Distance Traveled #1, 2, 10, 11, 19, 26, 32, 45, 46

Appendix A: Introduction to vectors

**Quiz 5****Week 9: October 31 – November 4**

§3.3 Distance Traveled in Space and Arc Length #1, 3, 19, 21, 24

§3.5 Volume (1<sup>st</sup> day) #1, 2, 8-11, 13, 29, 39, 48, 51

§3.5 Volume (2<sup>nd</sup> day) #1, 2, 8-11, 13, 29, 39, 48, 51

**Quiz 6****Week 10: November 7 – 11**

§3.9 Work and Energy (1<sup>st</sup> day) #1, 3, 5, 8, 9, 13, 23, 25, 29, 39, 42

Review & **Hour Test 2**

**Week 11: November 14 – 18**

§3.9 Work and Energy (2<sup>nd</sup> day) #1, 3, 5, 8, 9, 13, 23, 25, 29, 39, 42

*The following sections are in the multivariable text*

§1.2  $\mathbb{R}^n$  as a vector space #1, 3, 5, 7, 9, 10, 13-16, 19-21, 23-24, 27, 29, 33, 36, 41-43, 45, 46

§1.3 Dot product, angles, and orthogonal projection #1-4, 9-12, 17-19, 22, 23, 27-30, 33-35, 45-48

**Quiz 7****Week 12 (partial): November 21 – 22**

§1.4 Lines, planes, and hyperplanes #1-4, 9-12, 13-17, 19, 21-23, 27-30

**Wednesday, Thursday, and Friday, Thanksgiving recess, no classes**

**Week 13: November 28 – December 2**

§1.5 Cross product (1<sup>st</sup> day) #1-4, 9-12, 17-20, 27-29, 31, 35, 37, 41

§1.5 Cross product (2<sup>nd</sup> day) #1-4, 9-12, 17-20, 27-29, 31, 35, 37, 41

Begin review for the final exam

**Quiz 8****Week 14 (partial): December 5 – 7**

Review for the final exam

**Thursday, December 8, Reading day, no classes**

**December 9 – 16, Final Exams**

**Some Additional Items:**

1. Any student with a disability is encouraged to meet with the instructor during the first week of classes to discuss accommodations. The student must bring a current Memorandum of Accommodations from the Disability Resource Center (DRC).
2. If you are an athlete and have conflicts with an important class activity (quiz, 65-minute test, or final), you should let your instructor know before the end of second week of classes. You should also bring an official letter from the Office of Athletics.
3. If you must miss a 65-minute hour test, you should let your instructor know as soon as possible.
4. This syllabus is subject to change. It is your responsibility to be aware of any changes to the syllabus announced in class or posted on Canvas. Students are responsible for all information given when they are absent.

**Academic Integrity Policy:** Cheating will not be tolerated. All incidents of cheating will be reported. From the Academic Integrity Policy: (see <http://www.northeastern.edu/osccr/academic-integrity-policy/>)

“A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues.”

**Title IX Protections and Resources:** Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal funding. Any NU community member who has experienced such discrimination, sexual assault, relationship violence, stalking, coercion, and/or sexual harassment, is encouraged to seek help. Confidential support and guidance can be found through [University Health and](#)

[Counseling Services](#), the Northeastern [Center for Spirituality, Dialogue, and Service](#), and the [Office of Prevention and Education at Northeastern \(OPEN\)](#). Note that faculty members are considered “responsible employees” at Northeastern University, meaning they are required to report all allegations of sex or gender-based discrimination to the Title IX Coordinator. For additional information and assistance please see the [Office of Institutional Diversity and Inclusion](#) webpage.

**Inclusion and Diversity:** I value all students regardless of their background, country of origin, race, religion, gender, sexual orientation, ethnicity, or disability status, and am committed to providing a climate of excellence and inclusiveness within all aspects of the course. If there are aspects of your culture or identity that you would like to share with me as they relate to your success in this class, I would be happy to discuss these with you. Also, if you have any concerns in this area or are facing any special issues or challenges, I encourage you to discuss the matter with me as you feel comfortable, with assurance of full confidentiality (the only exception being mandatory reporting of NU Academic Integrity Policy violations and Title IX sex and gender discrimination).

**Disability Resource Center:** The university’s [Disability Resource Center](#) works with students and faculty to provide students who qualify under the Americans With Disabilities Act with accommodations that allow them to participate fully in the activities at the university. Ordinarily, students receiving such accommodations will deliver teacher notification letters at the beginning of the semester. Students have the right to choose whether to disclose their specific disabilities to instructors but must provide a letter to receive accommodations.

**College of Science Policies:** The current College of Science Academic Course Policies is available at <https://cos.northeastern.edu/wp-content/uploads/2012/10/COS-teaching-policies-April-2017.pdf>.

**TRACE:** Every student is expected to complete the online TRACE survey at the end of the semester.

**WeCare:** [WeCare](#) offers supports for students during times of difficulty or challenge. You can find WeCare at 226 Curry Student center Monday - Friday from 8:30-5:00, call at 617-373-7591, or email [wecare@northeastern.edu](mailto:wecare@northeastern.edu).

**Mental Health Resources:** In addition to mental health resources available through [Northeastern’s University Health and Counseling Services](#) Northeastern has added [Find@Northeastern](#), which is a 24/7 mental health consulting line and can be reached at 1-877-223-9477.

**The Writing Center:** The [Northeastern University Writing Center](#) offers free and friendly tutoring for any level of writer, including help with conceptualizing writing projects, the writing process, and using sources effectively. The Writing Center has two on-ground locations: 412 Holmes Hall and 136 Snell Library as well as virtual appointment services. To make an appointment, or learn more about the Writing Center, visit <https://www.northeastern.edu/writingcenter>, or email [WritingCenter@northeastern.edu](mailto:WritingCenter@northeastern.edu). Advance and same-day appointments are available.