

MTH 243 – SECTION 5 – FALL 2019

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Office : 102D Lippitt Hall
Office Hours : 11:00am - 12:00pm Tuesday and Thursday, 10:00am-11:00am Wednesday
Course website : (visit Sakai)
Course meets : TuTh 12:30pm-1:45pm in Lippitt Hall 205

Course Description

MTH 243 is the third calculus course for students in STEM areas. In this course, we will focus on generalizing the basic concepts of functions of single variable to functions of two or three variables – such as, graphing functions, calculating derivatives and integrals, identifying critical points. We will also use vector analysis and parametrizations to understand the change in a function – examples include functions describing motion, velocity and acceleration.

You will need a C- or better grade in MTH 142 to enroll in MTH 243.

MTH 243 Calculus for Functions of Several Variables satisfies A1 and B3 requirements.

Course Goals

The goals of the course are

- Provide an introduction to multivariable Calculus, which is essential to natural and mathematical sciences, engineering and other areas.
- Expose students to mathematical concepts and provide mathematical skills needed in their area of specialization.
- Help students to become effective mathematics problem solvers, specifically help them to
 - Understand concepts rather than merely mimic techniques.
 - Demonstrate understanding through explanation.
 - Understand the relationship between a process and the corresponding inverse process.
 - Select between formal and approximate methods for solution of a problem, and make judgments about the appropriateness of the choice.
 - Select the proper mathematical tool(s) for the task at hand.

Required Materials

★ Textbook

The textbook for this class is *Calculus: Single and Multivariable* (7th Edition) by Deborah Hughes-Hallett, Andrew Gleason, William McCallum, et al., Wiley.

★ WileyPlus code

You will be given weekly homework assignments via the WileyPlus Online Homework System. Typically homework assignments will be made available the Monday of the week and will be due Thursday of the following week. Late submissions will be subject to point reductions.

To sign up for this system, you will need a WileyPlus registration code.

- If you buy a new text book, make sure to buy the book bundled with WileyPlus code.
- If you buy a used book, you need to buy the WileyPlus registration code separately. You can directly purchase the code from the WileyPlus website; you should also be able to buy the code alone from URI book store.
- Your WileyPlus code comes with an electronic version of the text book in your WileyPlus account.

You register for the WileyPLUS system by visiting www.wileyplus.com/class/718454 which is the designated webpage for our course and section. You may also refer to the flyer that will be shared with you on Sakai for directions.

★ **Calculators** are **NOT** required in this course nor allowed in the exams or quizzes.

Grading

Final grades will be based on quizzes, online homework assignments on WileyPlus, two midterm exams, and a comprehensive final exam. Total weight of each component is distributed as follows:

	Points available
WileyPlus	12.5% – see details above, under Required Materials.
Class Work	12.5% – details will be given in class.
Exams	40% – each worth of 20%. <ul style="list-style-type: none"> • Thursday, October 10, 2019, in class. • Thursday, November 14, 2019, in class.
Final Exam	35% – Thursday, December 12, 2019 .

The policy regarding make-up exams can be found under the Policies below.

There is no alternative credit in this course. Assignments will not be graded on a curve nor will any extra credit be made available.

Letter Grade Distribution

Final grades will be determined according to the following scale.

92 – 100	A
90 – 91.99	A-
87 – 89.99	B+
82 – 86.99	B
80 – 81.99	B-
77 – 79.99	C+
72 – 76.99	C
70 – 71.99	C-
67 – 69.99	D+
60 – 66.99	D
0 – 59.99	F

Expectations

Much of the learning of this course will happen outside the classroom time: by reviewing the lecture notes daily, completing homework assignments and preparing for quizzes. You are encouraged to start working on assignments and practice problems right away, and seek help from your instructor or tutors at AEC (<https://web.uri.edu/aec/tutoring/>) whenever you feel like you are stuck. It is very important that you do not let “problems” pile up. Moreover,

- You are expected to attend every lecture, and to submit your homework on time. We cover a great deal of information at a rapid pace; missing a class will result in a large amount of material missed. Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee’s responsibility to get all missing notes or materials.
- It is your responsibility to communicate clearly in writing up solutions for homework, quizzes, and exams. Your results must display your understanding well and be written in a correct, complete, coherent, and well organized fashion. The rules of language still apply in mathematics, and they apply even when symbols are used in formulas, equations, etc. Precise communication and neatness count!
- The pace of the class requires that you spend enough time every day doing homework, reviewing notes, reading the textbook, and working out extra problems, all in addition to the time spent in class.

Learning Outcomes

At the end of the course you should be able to:

- **Functions of several variables.** Recognize functions of two or three variables from surface graphs, cross sections, contour diagrams and tables. Sketch graphs and contours of functions given by simple formulas.
- **Vectors.** Apply basic vector operations, geometrically and algebraically. Calculate and interpret dot and cross product.
- **Differentiation.** Calculate partial derivatives, directional derivatives and gradients. Approximate differentiable functions using quadratic Taylor polynomials.
- **Optimization.** Find critical points and identify local extrema.
- **Integration.** Calculate double and triple integrals in Cartesian, polar, cylindrical and spherical coordinates.
- **Parametrization of curves in three dimension.** Write out a parametrization for a line, and find intersections of curves and surfaces. Compute velocity and acceleration of an object moving along a parametrized path.
- **Line integrals.** Calculate line integrals using parametrizations. Find the change in a function of multivariable using the Fundamental Theorem of Calculus for line integrals. Use line integrals and Green's Theorem to deduce if a given vector field is path-dependent.

General Exam Policies

- No calculators, notebooks, textbooks or cheat sheets are allowed in the exam.
- During the exam, you may not leave the room for any reason. Please remember to use the bathroom before the exam.
- No cell phones, MP3 players, smart watches, or any electronic devices of any kind may be used or even accessible to you at any time during the exam. Any student found with any electronic device for any reason during the exam will be considered to be cheating.

Exam and Quiz Make Up Policy

Makeup exams/quizzes may be scheduled in the event you are unable to attend exams/quizzes under the following conditions. In particular, if you must miss the exam because of a scheduling conflict, you must notify your instructor before, not after, the exam, and emergencies require you to contact your instructor within 24 hours. See University Manual sections 8.51.10 and 8.51.14 for guidelines.

- If your reason for missing the exam as scheduled is (i) a University sanctioned event for which verifiable documentation can be provided (including another scheduled class), (ii) a responsibility to an employer that cannot be rescheduled (with documentation from your employer), or (iii) Religious holidays, then you **MUST INFORM YOUR INSTRUCTOR 48 HOURS IN ADVANCE OF THE EXAM AND PROVIDE DOCUMENTATION IF REQUESTED**. Makeup exams will be scheduled after the actual exam, and preferably before the class period when exams are to be handed back, but no later than one week after the original date.
- If the reason for missing the exam as scheduled is due to (i) illness (with verifiable documentation from a medical provider), or (ii) an emergency (with appropriate documentation), then you **MUST INFORM YOUR INSTRUCTOR WITHIN 24 HOURS OF THE EXAM** and provide documentation upon your return. Failure to notify your instructor within 24 hours will result in a 0 for the exam. No exceptions. Makeup exams may be scheduled no later than a week after the original date, unless the illness or emergency precludes this, in which case the makeup exam will be given on a common date during the last few weeks of the semester.
- If your circumstances do not meet either of the above (no documentation, a non-emergency excuse without sufficient notice, etc.), then you will receive a zero for the missed exam. No exceptions.

Electronic Devices

Cell phones should be kept on silent mode during class. All other electronic devices (ipads, ipods, laptops, etc.) should be turned off during class. They can be a distraction to you and your classmates. Excepted from this are tablets used for note-taking.

Academic Honesty Policy

Cheating is defined in the University Manual section 8.27.10 as the claiming of credit for work not done independently without giving credit for aid received, or any unauthorized communication during examinations. Students are expected to be honest in all academic work. The following are examples of academic dishonesty:

- Claiming disproportionate credit for work not done independently
- Unauthorized possession or access to exams
- Unauthorized communication during exams
- Unauthorized use of another's work or preparing work for another student
- Taking an exam for another student
- Altering or attempting to alter grades
- The use of notes or electronic devices to gain an unauthorized advantage during exams
- Facilitating or aiding another's academic dishonesty

The resolution of any charge of cheating or plagiarism will follow the guideline set forth in the University Manual sections 8.27.10-8.27.21.

Furthermore, course content and outlines, exams, and assignments created by instructors shall be considered the instructors' intellectual property. Course materials shall not be distributed, shared in any public domain or third party website, or sold without prior written consent of the instructor. See the University Manual section 8.27.22.

Special Needs

Any student with a documented disability may contact the instructor early in the semester so that reasonable accommodations may be arranged. Students can contact Disability Services for Students: Office of Student Life, 330 Memorial Union, 874-2098. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Incomplete Grade

University of Rhode Island regulations concerning incomplete grades will be followed. See University Manual sections 8.53.20 and 8.53.21 for details.

Religious Holidays

It is the policy of the University of Rhode Island to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students who plan to be absent from classes or examinations for religious holy days that traditionally preclude secular activity shall discuss this with the appropriate instructor(s) in advance of the holy day. See University Manual section 8.51.11 for details.

Standards of Behaviour

Students are expected to treat faculty and fellow classmates with dignity and respect. Students are responsible for being familiar with and adhering to the published "Community Standards of Behavior: University Policies and Regulations" which can be accessed in the University Student Handbook web.uri.edu/studentconduct/university-student-handbook/

Calendar

Below is an approximate timetable for the course. Any changes in the schedule will be announced in class. Please refer to the textbook for the practice problems.

Week of	Sections/Events	Practice Problems
Sept 2	Classes begin on Wednesday, September 4 12.1 Functions of Two Variables 12.2 Graphs and Surfaces	(12.1) 1,3,5,7,8,9,10,11,12,13,14,17,18,19,23,27,33,37,41,43,45 (12.2) 1,3,6,7,9,11,13,15,16,17,18,19,20,21,34,35,43,44,45,47,53
Sept 9	12.2 Graphs and Surfaces (continued) 12.3 Contour Diagrams 12.4 Linear Functions	(12.3) 1,2,3,4,5,7,9,10,11,16,18,23,25,30,33 (12.4) 1,2,3,4,5,7,10,11,12,21,22,25,35,36,46,47,50,52,57
Sept 16	12.5 Functions of Three Variables 13.1 Displacement Vectors 13.2 Vectors in General	(12.5) 1,2,3,4,6,8,9,10,16,17,19,20,30,47,49,51,53 (13.1) 1-5,7,9,11,15,17,21,25,29,31,33,34,37-39,41,54-56,59,60 (13.2) 1,2,4,6,7,8,9,10,11,15,17
Sept 23	Last Day to Drop courses without a “W” on transcript Wednesday, September 25 13.3 The Dot Product 13.4 The Cross Product	(13.3) 1,3,4,5,11,15-25(odd),28-36,40,42,44,51,52,59,63,71 (13.4) 1,3,5,9,11,24,29,34
Sept 30	14.1 The Partial Derivative 14.2 Computing Partial Derivatives Analytically 14.3 Local Linearity and the Differential	(14.1) 1,4,5,6,8,11,13,15,17,19,20,29 (14.2) 3,5,7,9,11,23,24,25,31,35 (14.3) 1,3,5,7,9,11,13,26,29,37
Oct 7	Exam 1, Thursday, October 10, in class 14.4 Gradients and Directional Derivatives in the Plane 14.5 Gradients and Directional Derivatives in Space	(14.4) 1,7,11,15,17,19,21,23,25,27,29,31,33,45,47,49,75,97 (14.5) 3,7,13,17,19,21,25,27,69
Oct 14	Columbus Day, no classes on Monday, Oct 14 Monday Classes meet on Tuesday, October 15 14.5 Gradients and Directional Derivatives in Space (continued) 14.6 The Chain Rule	(14.6) 1,3,7,9,18,19,20,27,29,47
Oct 21	14.7 The Second-Order Partial Derivatives 15.1 Critical Points: Local Extrema and Saddle Points 15.3 Lagrange Multipliers (Read only)	(14.7) 1,3,5,7,8,23,25,49 (15.1) 1,2,3,4,8,14,15,19,21,25,29,41,42,53,54
Oct 28	16.1 The Definite Integral 16.2 Iterated Integrals	(16.1) 1,3,9,11,17 (16.2) 1-7(odd),15-25(odd),34,36,39,43,44,53,54,60,61,62,65
Nov 4	16.3 Triple Integrals 16.4 Double Integrals in Polar Coordinates	(16.3) 1,2,5,7,9,11,13,15,37,39,45,55 (16.4) 1,3,4,5,9,11,16,17,19,20,21,31,34,36,49
Nov 11	Veteran’s Day, no classes on Monday, Nov 11 16.5 Integrals in Cylindrical and Spherical Coordinates 17.1 Parametrized Curves	(16.5) 3,4,5,8,9,11,13,15,19,21,23,24,25,29,31,51 (17.1) 1,2,3,6,7,9,11,13,15,19,20,23,27,53,61,62,65,76
Nov 18	Exam 2, Thursday November 21, in class 17.2 Motion, Velocity and Acceleration	(17.2) 1,3,6,7,9,17,19,22,26,57
Nov 25	Thanksgiving Recess November 27-December 1 17.3 Vector Fields	(17.3) 1,2,3,4,5,6,7,8,11,12,15,21,31
Dec 2	18.1 The Idea of a Line Integral 18.2 Computing Line Integrals over Parametrized Curves 18.3 Gradient Fields and Path-independent Fields	(18.1) 1,2,3,9,11,32 (18.2) 1,3,7,9,11,12,13,14,19,35,36,41 (18.3) 1,3,5,13,17,18,19,24,35,37
Dec 9	18.4 Path-dependent Vector Fields and Green’s Thm Final Exam Thursday, Dec 12, 11:30-2:30pm	(18.4) 1,2,3,5,6,11,12,13,14,15