Math 2415: Calculus of Several Variables

Summer 2017

Course section: MATH2415.0U1.17U, MW: 12:30pm-2:45pm JSOM 12.202
Instructor: Dr. Zalman Balanov
Office: FO 2.408E
Office hours: MW, 3:00-4:00pm, or by appointment
E-mail: balanov@utdallas.edu
Phone: (972) 883 6591

Problem Sections:

Section	Day	Time	Room	TA's Name	Office	Office hours
2415.8U2	M	5:30pm-7:45pm	FN 2.202	Ivan Gudoshnikov	BSB Lobby	Th. 12:00-1:00pm
2415.8U1	M	5:30pm-7:45pm	GR 4.208	Sonam Lama	FO 1.204	Th. 12:00-1:00pm

Prerequisites: A grade of C- or better in MATH 2414 or equivalent.

Students MUST be registered for ONE of these problem sections: Math 2415.8U2, Math 2415.8U1.

During problem section, the TA will:

- review class material and relevant material from prerequisite courses
- return and discuss homework, quizzes and exams
- work problems, or have students work problems
- entertain questions
- collect weekly homework
- administer weekly quizzes

Textbook

James Stewart, *Calculus. Early Transcendentals*, Cengage Learning, John Wiley & Inc. 8-th edition.

Course description

Continuation of the MATH 2413, 2414 calculus sequence. The course covers differential and integral calculus of functions of several variables. Topics include vector valued and scalar functions, partial derivatives, directional derivatives, chain rule, Lagrange multipliers, multiple integrals, change of variables in double and triple integrals, the line integral, Green's Theorem, Stokes's Theorem, and Divergence Theorem.

Student Learning Objectives

1. Students will be able to formulate real world problems into mathematical statements. Given a narrative description of a problem that lends itself to mathematical analysis, the student will clearly define any variable quantities introduced and provide an appropriate equation, function, or formula relating those variables.

2. Students will be able to develop solutions to mathematical problems at the level appropriate to the course. Students will be able to describe plane and space curves via vector valued functions and describe their physical attributes using calculus and vector operations. Given a scalar function of several variables, students will compute a partial derivative of specified order and, if instructed, evaluate the partial derivative at a point in its domain. Students will compute a multiple integral.

3. Students will be able to describe or demonstrate mathematical solutions either numerically or graphically. Students shall provide a qualitative, planar sketch which clearly indicates prescribed attributes. Students shall provide numerical results to a specified accuracy, or as a percent.

Assignments, quizzes and exams

Homework assignments: The homework assignments will be published and updated weekly on the elearning website, with their due dates specified. Homework will be collected in your problem section. **Late homework will NOT be graded**.

Quizzes: There will be a weekly quiz during the problem session organized and marked by the teaching assistant.

Exams: There will be three examinations. Textbooks, notes, calculators or other electronic devises won't be allowed during examination. No exams and assignment may be dropped except in extraordinary circumstances. Missed exams and assignments are a zero. The midterms and

final examinations have been scheduled as follows:

	Date	**Time**	**Room**
Exam I	June 21, Wednesday	12:30pm-2:45pm	JSOM 12.202
Exam II	July 19, Wednesday	12:30pm-2:45pm	JSOM 12.202
Final Exam	August 9, Wednesday	12:30pm-2:45pm	JSOM 12.202

Grade policy

Graded assignments: 15%
Weekly Quizzes in Problem Sessions: 10%
Midterm exam I: 25%
Midterm exam II: 25%
Final exam: 25%.

Important Dates

Tuesday, May 30: Classes begin
Monday, May 29: University Closing, Memorial Day
Tuesday, July 4: University Closing, Independence Day
Thursday, June 8: Census Day
Thursday, June 8: Last Day to drop a class without a "W"
June 21, Wednesday: **Midterm Exam I**
July 19, Wednesday: **Midterm Exam II**
August 9, Monday: **Final Exam**
Thursday, August 10: Last Day of Full-Term Session

Further important dates:
http://www.utdallas.edu/academiccalendar/

Detailed course description

1. Three-dimensional coordinate systems, coordinate planes, distance, vectors, length and direction of vector, algebraic operations with vectors, basis, components of vector, geometric and physical applications of vectors.

2. Dot product of vectors, algebraic properties of dot product, dot product and angle between vectors, direction cosines, projections of vectors, cross product of vectors, geometric interpretation of cross product, algebraic properties of cross product, scalar triple product, geometric interpretation of scalar triple product.

3. Equations of lines (vector, parametric and symmetric forms), equations of plane (vector form, scalar equation through a point with normal vector), parallel planes, distance between a point and plane.

4. Cylinders and quadric surfaces, parabolic cylinder, ellipsoid, elliptic paraboloid, hyperbolic paraboloid.

5. Vector function, limit of vector function, continuous vector functions, space curve, derivatives and integrals of vector functions, tangent vector, tangent line, differentiation rules.

6. Parametrization of a curve, arc length, natural parametrization, curvature, normal and binormal vectors, normal plane, osculating plane.

7. Functions of two variables, graphs, level curves, functions of three or more variables, level surfaces, limits and continuity of functions of several variables

8. Partial derivatives (formal/intuitive definition) and their geometric interpretation, tangent plane, linear approximation, differentiability, differential, chain rule, implicit differentiation.

9. Directional derivatives, gradient, maximum rate of change, gradient and level sets.

10. Local maximum/minimum, absolute maximum/minimum, critical point, saddle point, Extreme Value Theorem, absolute maximum/minimum values on bounded closed sets.

11. Lagrange multipliers method with one and two constraints.

12. Double integrals over rectangles, volume and double integrals, properties of double integral (linearity and monotonicity), iterated integral, Fubini's Theorem.

13. Double integrals over general regions, double integral in polar coordinates.

14. Triple integral over a box, triple integral over a general region.

15. Triple integral in cylindrical coordinates, triple integral in spherical coordinates, Jacobian and change of variables in multiple integrals.

16. Vector fields (physical examples), gradient field and a potential function.

17. Piecewise-smooth curve, line integrals of functions, line integrals of vector fields, the Fundamental Theorem for line integrals, line integral of conservative vector fields, conservation of energy.

18. Green's Theorem, curl and divergence, vector forms of Green's Theorem.

19. Parametric surfaces, surfaces of revolution, tangent planes, surface area, oriented surfaces, surface integrals of vector fields.

20. Stokes' Theorem, Divergence Theorem.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go to http://go.utdallas.edu/syllabus-policies for these policies.

These descriptions and timelines are subject to change at the discretion of the Professor.