COURSE SYLLABUS

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YEAR COURSE OFFERED: 2020

SEMESTER COURSE OFFERED: Spring

DEPARTMENT: Mathematics

COURSE NUMBER: 2433

NAME OF COURSE: Calculus III

NAME OF INSTRUCTOR: David H. Wagner

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The information contained in this class syllabus is subject to change without notice. Students are expected to be aware of any additional course policies presented by the instructor during the course.
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Learning Objectives

Students will be expected to learn:
1. About vectors in a plane and in 3-dimensional space
2. About dot products and cross products of vectors
3. About projections and components of vectors
4. About equations of lines and planes in 3-dimensional space
5. About the calculus of vector functions of a single variable.
6. About the relationships between calculus and the geometry of curves in space–arclength and curvature.
7. How to compute tangent and normal components of acceleration for a body moving along a curve in space.
8. What it means for a function of several variables to be continuous, or differentiable.
9. How to compute the partial derivatives and gradient of a function of several variables.
10. About the relationship between the gradient and directional derivatives.
11. About the equality of mixed partial derivatives for sufficiently smooth functions.
12. The chain rule for the derivative of $f\big(\mathbf{g}(t)\big)$, where f is a function of several variables and g is a vector valued function.
13. How to find points where a function of several variables is "stationary" or has a local extreme value.
14. How to apply the second partials test to classify a stationary point.
15. About double and triple integrals
16. How to compute double integrals in polar coordinates.
17. How to compute triple integrals in cylindrical or spherical coordinates.
18. About the line integral of a vector field over a path in space.
19. The Fundamental Theorem of Line Integrals, and Green's Theorem.

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20. How line integrals relate to the physics of Work and Energy.
21. About surface area and surface integrals, at an intuitive level.
22. How to use the Divergence Theorem and the classical Stokes' Theorem.

Major Assignments/Exams

There will be two "hour" exams in CASA during the semester, a third "hour" exam in lecture, and a final exam. There will also be a number of quizzes given online and in recitations during the semester–approximately one online and one recitation quiz per week. A student's total quiz score will count for 10% of the grade. Each hour exam will count for 1/6 and the final exam will count 1/3. The total quiz score will count for 1/6 of the grade.

Required Reading

CALCULUS, 9th edition . Authors: Salas, Hille, Etgen. Publisher: John Wiley & Sons, Inc. 2003 Available online from CASA to all registered students.

Recommended Reading
Students are required to do the homework assignments at:
http://www.mathematics.uh.edu/undergraduate/courses/math2433/index.php#hw
The sections for which homework is due will be announced in lecture each week. Homework is to be turned in each Friday in recitation (lab). Homework will be checked for completion. Failure to turn in homework that is at least nearly complete will result in a score of 0 for that week's EMCF quiz.

List of discussion/lecture topics

Syllabus from http://www.mathematics.uh.edu/undergraduate/courses/math2433/index.php:

Chapter 12. VECTORS
Section 12.1 Cartesian Space Coordinates
Section 12.2 Displacements and Forces
Section 12.3 Vectors
Section 12.4 The Dot Product
Section 12.5 The Cross Product
Section 12.6 Lines
Section 12.7 Planes

Chapter 13. VECTOR CALCULUS
Section 13.1 Vector Functions
Section 13.2 Differentiation Formulas
Section 13.3 Curves
Section 13.4 Arc Length
Section 13.5 Curvilinear Motion; Curvature

EXAM I

Chapter 14. FUNCTIONS OF SEVERAL VARIABLES

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Section 14.1 Elementary Examples
Section 14.2 A Brief Catalogue of Quadric Surfaces; Projections
Section 14.3 Graphs; Level Curves and Level surfaces
Section 14.4 Partial Derivatives
Section 14.5 Open and Closed Sets
Section 14.6 Limits and Continuity; Equality of Mixed Partials

Chapter 15. GRADIENTS; EXTREME VALUES; DIFFERENTIALS
Section 15.1 Differentiability and Gradient
Section 15.2 Gradients and Directional Derivatives
Section 15.3 The Mean-Value Theorem; Chain Rules
Section 15.4 The Gradient as a Normal; Tangent Lines and Tangent Planes
Section 15.5 Local Extreme Values
Section 15.6 Absolute Extreme Values
Section 15.7 Maxima and Minima with Side Conditions
Section 15.8 Differentials
Section 15.9 Reconstructing a Function from its Gradient

EXAM II

Chapter 16. DOUBLE AND TRIPLE INTEGRALS
Section 16.2 The Double Integral
Section 16.3 The Evaluation of Double Integrals by Repeated Integrals
Section 16.4 Double Integrals in Polar Coordinates
Section 16.6 Triple Integrals
Section 16.7 Reduction to Repeated Integrals
Section 16.8 Triple Integrals in Cylindrical Coordinates
Section 16.9 The Triple Integral as a Limit of Riemann Sums; Spherical Coordinates
Section 16.10 Jacobians; Changing Variables in Multiple Integration

Chapter 17. LINE INTEGRALS AND SURFACE INTEGRALS
Section 17.1 Line Integrals
Section 17.2 The Fundamental Theorem for Line Integrals
Section 17.3 Work-Energy Formula; Conservation of Mechanical Energy
Section 17.4 Line Integrals with Respect to Arc Length
Section 17.5 Green's Theorem Section
Section 17.6 Parameterized Surfaces; Surface Area
Section 17.7 Surface Integrals
Section 17.8 The Vector Differential Operator Section
Section 17.9 The Divergence Theorem Section
Section 17.10 Stokes's Theorem

EXAM III

FINAL EXAM

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Counseling and Psychological Services
Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (www.uh.edu/caps) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the "Let's Talk" program, a drop-in consultation service at convenient locations and hours around campus. http://www.uh.edu/caps/outreach/lets_talk.html

Course Policies
- Late homework will not be accepted without a valid excuse. Valid excuses include documented serious illness/accident, or documented death in the student's immediate family.
- There will be no make-up exams given for the hour exams. Instead, if a student misses an hour exam, the normalized score for the final exam will replace the normalized score for the missed exam.
- Requests for grading correction must be submitted within two weeks after an exam or quiz has been returned to the class.