Course Information Sheet

Course: Math 173-01 - Calculus III - 5 Credit/Contact Hours - Spring 2015
IAI Code: M1 900-3, MTH 903
Delivery Mode: Face-to-face
Meeting Time: MW 12:00pm-12:50pm TTh 12:00pm-1:15pm
Meeting Place: Room 2625

Instructor: Steve Kifowit, Rm 2305, Ph. (708) 709-3954
Email: skifowit@prairiestate.edu
Web: http://stevekifowit.com
Office Hours: MTWTh 9am-10am, TTh 1:15pm-1:45pm, or by appointment

Text: *Calculus*, 10th edition (2014); Larson and Edwards

Course Description: This is the final course in the three-semester sequence of courses covering calculus for scientists and engineers. Topics covered include basic operations on vectors, vector-valued functions, functions of several variables, partial derivatives, multiple integrals, and introductory vector calculus.

Course Prerequisite: Math 172 (Calculus II) with a C or better or equivalent.

Course Goals/Objectives (detailed objectives are attached):
1.) Perform operations on vectors and vector-valued functions in 2- and 3-space, and use vectors and vector-valued functions in STEM applications.
2.) Use calculus techniques, such as differentiation, integration, and optimization, on functions of several variables, and apply these techniques to functions in STEM applications.
3.) Use calculus techniques in vector fields.
4.) Use computer algebra systems to solve vector and multi-variable calculus problems.

Attendance Policy: Regular class attendance is an essential component of successful learning. Students are responsible for prompt attendance and participation in all class meetings. If you miss class, you will not be allowed to make up any tests, quizzes, or assignments that you may have missed. All material covered in class is the student's responsibility.

Grading: Your grade will be based on your performance on three 100-point tests, a 150-point comprehensive final exam, approximately ten 10-point weekly quizzes, and miscellaneous problems and projects (0-50 points). Very roughly, tests count for about 55% of your grade, the final exam counts for about 27%, and quizzes count for about 18%. The grading scale is as follows:

A --- 88% and above
B --- 77% - 87%
C --- 66% - 76%
D --- 55% - 65%
F --- below 55%

You may estimate your current grade at any time during the semester by computing the following percentage: 100% * (Total points accumulated) / (Total points possible). Please feel free to discuss your grade with me at any time during the semester. Throughout the semester, grades will be posted online at http://www.engrade.com/skifowit.

Homework: Homework problems will be assigned on a daily basis. Your work will not normally be collected, but we will often discuss homework problems in class. If any suggested homework problems are to be

submitted for grading, you will be given advance notice of at least one class period. Keep up to date on your homework! Homework problems will often show up on quizzes and tests. Be sure to practice the conceptual problems!

Tests/Exams: Test problems will be similar to class examples, quiz problems, and homework problems. Some of the test problems may be multiple choice or writing problems, but you should mostly expect computational problems. Partial credit may be awarded on any type of problem, but only for correct work. Tests may have portions on which calculators are not allowed. You must work individually on all tests. No make-up tests will be given. At the end of the semester, your lowest test score will be replaced by two-thirds of your final exam score (if this helps you).

Quizzes: Be prepared for an in-class, ten-point quiz on each Thursday (unless a test is scheduled). No make-up quizzes will be given. All quiz work is to be done on an individual basis unless otherwise stated. At the end of the semester, your lowest quiz score will be dropped.

Final Exam: The final exam is comprehensive and will be worth 150 points toward your final grade. The final exam counts for more than 25% of your grade. Please take it seriously! See the lecture pace for the date of the final exam.

Calculators: The TI-83/84 Graphing Calculator is required for this course. At times, we will use the TI-92 during class. We will also make use of computer algebra systems such as Mathematica, Maxima, Sage, Mathics, or GeoGebra.

Disability Statement: Any student needing to arrange reasonable accommodations for a documented disability (learning, physical, psychological, or other) should contact the Disability Services Office (Room 1192).

Religious Observance Accommodation: Prairie State College is required to excuse students who need to be absent from class, examinations, study, or work requirements because of their religious beliefs, and provide students with a make-up opportunity, unless to do so would unreasonably burden the institution. Students must notify their instructor well in advance of any absense for religious reasons. If you require special accommodations for observance of a religious holiday, please notify me during the first week of the term.

Misc. information:
1.) The last day to withdraw from the course is April 10. For refund information, refer to the spring schedule book. If you wish to withdraw from the course, it is your responsibility to do so. Any student who does not come to class, yet fails to withdraw, will be given the FW grade.
2.) You are expected to spend roughly 15 hours per week on coursework - 5 hours in class and 10 hours out of class. If you cannot make this commitment, you may want to reconsider taking this course.
3.) The grading scale will be strictly adhered to! Final percentages will be rounded to the nearest whole number.
4.) This is a fast-paced course! We will cover much material in little time. You are responsible for thoroughly reading the textbook and keeping up with the assigned material.

Course information, including tests, quizzes, and answer keys, can be found at http://stevekifowit.com /classes/m173.htm

MATH 173 TOPICAL COURSE OUTLINE

I. Vectors

A. Vectors, operations, and applications (9-11 hours)
1. addition, subtraction, scalar multiplication
2. dot product and projections
3. cross product
4. lines and planes in space

B. Vector-valued functions (9-11 hours)
1. space curves and parametric equations
2. limits, derivatives, and integrals of vector-valued functions
3. projectile motion
4. tangent and normal vectors
5. arc length and curvature

II. Functions of Several Variables

A. Cylindrical and spherical coordinates (1-2 hours)
B. Quadric surfaces, graphs, level curves/surfaces (2-3 hours)
C. Limits and continuity (1-2 hours)
D. Differentiation (6-8 hours)
1. partial derivatives
2. differentials
3. linearizations
4. directional derivatives
5. gradient vectors
6. tangent planes and normal lines

E. Optimization (5-7 hours)
1. second partials test
2. Lagrange multipliers
3. applications

F. Taylor's Theorem for two-variable functions (optional)

III. Multiple Integrals

A. Double and triple integrals in rectangular coordinates (4-6 hours)
B. Double and triple integrals in polar/cylindrical/spherical coordinates (3-4 hours)
C. Applications of multiple integrals (3-4 hours)
D. Change of variables and Jacobians (1-2 hours)

IV. Vector Calculus

A. Vector fields (2-3 hours)
B. Line integrals (2-3 hours)
C. Green's Theorem (1-2 hours)
D. Applications of line integrals (1-2 hours)
E. Parametric surfaces and surface integrals (optional)
F. Divergence theorem, Stokes's Theorem (optional)

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Detailed course objectives

I. Constant Vectors

1. Find the component form of a vector given an initial and terminal point.
2. Find the magnitude of a vector and normalize vectors.
3. Find a vector with a given direction and magnitude.
4. Perform the operations of addition, subtraction, scalar multiplication, dot products, and cross products on vectors.
5. Determine if vectors are parallel or perpendicular (orthogonal).
6. Find the angle between two vectors.
7. Find the projection of one vector onto another.
8. Find a vector orthogonal to two given vectors.
9. Find a set of parametric equations for a line in space. Get a direction vector from a set of parametric equations for a line.
10. Given three points or a point and a normal vector, find an equation for a plane. Given an equation of a plane, find points and a normal vector.
11. Solve application problems involving vectors.

II. Vector-Valued Functions

1. Find the domain and sketch the graph of a vector-valued function.
2. Perform operations on vector-valued functions, e.g. find limits, differentiate, integrate, antidifferentiate, etc.
3. Given a position, velocity, or acceleration vector, find the other vectors. Solve projectile motion problems.
4. Find the unit tangent vector and the principal unit normal vector.
5. Find the arc length of a space curve.
6. Find the curvature of a curve at a point.

III. Functions of Several Variables

1. Find the domain and range of a multi-variable function.
2. Find limits of multi-variable functions. You may need to use algebraic techniques such as factoring, multiplying by the conjugate, etc. You may need to convert to polar coordinates.
3. Use the two-path test to show that a limit does not exist.
4. Find partial derivatives and mixed partial derivatives of all orders.
5. Use the chain rule for functions of several variables.

6. Find the gradient vector for a multi-variable function.
7. Use the gradient vector to find directional derivatives and directions of maximum increase and decrease.
8. Use the gradient vector to find tangent planes and normal lines.
9. Use the second partials test to find relative extrema for a two-variable function.
10. Use Lagrange multipliers to solve a constrained optimization problem.

IV. Multiple Integration

1. Evaluate iterated integrals.
2. Sketch the region of integration and reverse the order of integration for double integrals.
3. Set up and evaluate double integrals in rectangular and polar coordinates.
4. Find the area of a plane region, find the center of mass of a thin plate, find the average value of a two-variable function.
5. Be familiar with common surfaces in space, e.g. spheres, paraboloids, cones, planes, cylinders, etc.
6. Set up and evaluate triple integrals in rectangular, cylindrical, and spherical coordinates.
7. Find the volume of a space region, find the center of mass of a solid, find the average value of a three-variable function.
8. Compute the Jacobian and use it to change variables in a double integral.

V. Line Integrals

1. Sketch a vector field.
2. Determine if a vector field is conservative.
3. Evaluate line integrals.
4. Find the scalar potential function for a conservative vector field.
5. Use the potential function to evaluate the line integral of a conservative field.
6. Use Green's theorem to evaluate a 2D line integral.
7. Use a line integral to compute work.

Lecture Pace

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Week 1	Jan 12-Jan 15	Course information; Sections 11.1, 11.2	Intro to vectors in 2D and 3D **(No class Wednesday)**
Week 2	Jan 20-Jan 22	Sections 11.3, 11.4	Dot product, Cross product **(No class Monday)**
Week 3	Jan 26-Jan 29	Sections 11.5, 11.6, 12.1	Lines & planes, Surfaces, Vector-valued functions
Week 4	Feb 2-Feb 5	Sections 12.2, 12.3, 12.4	Velocity & acceleration, Tangent & normal vectors
Week 5	Feb 9-Feb 12	Section 12.5; Review/Catch-up; **Test 1**	Arc length & curvature
Week 6	Feb 16-Feb 19	Sections 13.1, 13.2	Multi-variable functions
Week 7	Feb 23-Feb 26	Sections 13.3, 13.4, 13.5	Partial derivatives, Differentials, Chain rule
Week 8	Mar 2-Mar 5	Sections 13.6, 13.7, 13.8	Directional derivatives, Tangent planes, Optimization
Week 9	Mar 9-Mar 12	Section 13.9, 13.10	Optimization, Lagrange multipliers
Week 10	Mar 16-Mar 19	**Spring Break --- No class**	
Week 11	Mar 23-Mar 26	Sections 14.1, 14.2; **Test 2**	Double integrals
Week 12	Mar 30-Apr 2	Sections 14.3, 14.4, 14.5	Double integrals in polar coords, Applications
Week 13	Apr 6-Apr 9	Sections 14.6, 11.7, 14.7	Triple integrals with applications, Cylindrical/Spherical coords
Week 14	Apr 13-Apr 16	Sections 14.8, 15.1, 15.2	Change of variables, Vector fields, Line integrals
Week 15	Apr 20-Apr 23	Section 15.2; Review/Catch-up; **Test 3**	Line integrals
Week 16	Apr 27-Apr 30	Sections 15.3, 15.4	Conservative vector fields, Green's theorem
Week 17	May 4-May 7	Topics from Sections 15.5-15.8	Divergence & Stokes theorems
*******	Monday, May 11	**Final Exam---10am-11:50am**	

***** April 10 is the last day to withdraw *****