Course Information Sheet

Course: Prairie State College Math 173-01 - Calculus III - 5 Credit/Contact Hours - Spring 2019
IAI Code: M1 900-3, MTH 903
Delivery Mode: Face-to-face
Meeting Time: MW 12:30pm-1:20pm TTh 12:30pm-1:45pm
Meeting Place: Room 2625

Instructor: Steve Kifowit, Rm 2305, Ph. (708) 709-3954
Email: skifowit@prairiestate.edu
Web: http://stevekifowit.com
Office Hours: MW 10:30am-12:30pm, TTh 12pm-12:30pm, or by appointment

Text: *Calculus*, 11th edition (2018); 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):
General Education Objectives---The mathematics component of general education focuses on quantitative reasoning to provide a base for developing a quantitatively literate college graduate. Every college graduate should be able to apply simple mathematical methods to the solution of real-world problems. A quantitatively literate college graduate should be able to:
a.) interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them;
b.) represent mathematical information symbolically, visually, numerically and verbally;
c.) use arithmetic, algebraic, geometric and statistical methods to solve problems;
d.) estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives and select optimal results; and
e.) recognize the limitations of mathematical and statistical models.

Specific Course Objectives---In addition to meeting the general education objectives, every successful Math 172 student should be able to:
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.

PSC College-wide General Education Learning Outcomes: Prairie State College's general education outcomes encapsulate the core knowledge and skills that we believe equip students to develop personally, as critical thinkers, and as global citizens. The specific college-wide learning outcome for this course is: **Problem solving**--Students will locate and identify information, determine what problem exists, develop solutions, evaluate results, and extend results to new situations. In class, we will model good problem solving on a daily basis, but also expect to be assessed on this problem solving outcome throughout the semester.

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 (but you may reschedule a test or quiz, or submit an assignment, in advance of a missed class period).** 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 final exam, approximately ten 10-point quizzes, 50 points worth of WebAssign work, and miscellaneous problems and projects (0-20 points). Very roughly, tests count for about 50% of your grade, the final exam counts for about 25%, and quizzes count for about 17%. The grading scale is as follows:

$$A \text{ --- } 88\% \text{ and above}$$
$$B \text{ --- } 77\% - 87\%$$
$$C \text{ --- } 66\% - 76\%$$
$$D \text{ --- } 55\% - 65\%$$
$$F \text{ --- below } 55\%$$

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 in D2L.

Homework: Textbook homework problems will be assigned on a daily basis. Your work will not normally be collected, but we will discuss homework problems in class. If any suggested written homework problems are to be submitted for grading, you will be given advance notice of at least one class period. Keep up to date with the homework! Homework problems (or very similar problems) often show up on quizzes and tests. WebAssign problems (very similar to textbook problems) will also be assigned on a regular basis. WebAssign work will count for a total of 50 points at the end of the semeter---those points will not appear in your D2L gradebook until the end of the semester.

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. Quizzes may have in-class and take-home portions. 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 about 25% of your grade. Please take it seriously! See the lecture pace for the date of the final exam.

Academic Honesty: In a Math class, it is extremely important that the work you present to your instructor is genuinely something that you have produced. Relying heavily on other people and/or inappropriate technology can create a false sense of achievement that ultimately leads to failure when those resources are no longer available. Part of my role as your instructor is to communicate to you what resources are acceptable and appropriate. The use of inappropriate resources is a form of academic dishonesty. In general, the use of any technology or human help that allows students to simply present a problem and have the problem solved for them is prohibited. Please feel free to speak to me if you are not sure whether you are allowed to use a particular resource in doing the work for this class. There are serious consequences for submitting work that is not your own. Possible consequences include a zero score for the assignment, failure of the class, or expulsion from the college. All cases of academic dishonesty will be reported to the dean.

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

Phones/Tablets/Laptops: Electronic devices may be used for notetaking and computing during lectures, but they may not be used on in-class tests and quizzes. These devices must be silenced and put away during tests and quizzes. Students in special circumstances who require their phones to be readily available must discuss their situations with the instructor.

Misc. information:
1.) The last day to withdraw from the course is April 12. 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.

Disability Disclosure: Prairie State College recognizes its responsibility and has an institutional commitment to provide equal educational opportunities for students with disabilities in accordance with Section 504 of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act of 1990. Any student needing to arrange reasonable accommodations for a documented disability (learning, physical, psychological, health, or other) should contact the Office of Disability Services located in the Counseling & Academic Advising Center, Room 1200. All discussions are confidential.

Student Veterans Statement: Veterans and those currently serving in the Armed Services may be eligible for various benefits. Information and support are available in the Student Veterans Center (Room1240). Online information is available at http://prairiestate.edu/student-services/veterans-services/index.aspx.

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.

Extra help/Tutoring: Please seek out help as soon as you need it. I am availble to help during my office hours, but also consider using free tutoring available in the Student Success Center (Room 2629). For more information on tutoring in the Student Success Center, call (708) 709-3663 or (708) 709-3507.

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

Lecture Pace

Math 173-01 - Calculus III

Week 1	Jan 14-Jan 17	Course information; Sections 11.1, 11.2	Intro to vectors in 2D and 3D
Week 2	Jan 22-Jan 24	Sections 11.3, 11.4	Dot product, Cross product
Week 3	Jan 28-Jan 31	Sections 11.5, 11.6, 12.1	Lines & planes, Surfaces, Vector-valued functions
Week 4	Feb 4-Feb 7	Sections 12.2, 12.3, 12.4	Velocity & acceleration, Tangent & normal vectors
Week 5	Feb 11-Feb 14	Section 12.5; Review/Catch-up; **Test 1**	Arc length & curvature
Week 6	Feb 19-Feb 21	Sections 13.1, 13.2 **(No class on Feb 18)**	Multi-variable functions
Week 7	Feb 25-Feb 28	Sections 13.3, 13.4, 13.5	Partial derivatives, Differentials, Chain rule
Week 8	Mar 4-Mar 7	Sections 13.6, 13.7, 13.8	Directional derivatives, Tangent planes, Optimization
Week 9	Mar 11-Mar 14	**Spring Break --- No class**	
Week 10	Mar 18-Mar 21	Section 13.9, 13.10; **Test 2**	Optimization, Lagrange multipliers
Week 11	Mar 25-Mar 28	Sections 14.1, 14.2, 14.3	Double integrals
Week 12	Apr 1-Apr 4	Sections 14.3, 14.4, 14.5	Double integrals in polar coords, Applications
Week 13	Apr 8-Apr 11	Sections 14.6, 11.7, 14.7	Triple integrals with applications, Cylindrical/Spherical coords
Week 14	Apr 15-Apr 18	Sections 14.8, 15.1, 15.2	Change of variables, Vector fields, Line integrals
Week 15	Apr 22-Apr 25	Section 15.2; Review/Catch-up; **Test 3**	Line integrals
Week 16	Apr 29-May 2	Sections 15.3, 15.4	Conservative vector fields, Green's theorem
Week 17	May 6-May 9	Topics from Sections 15.5-15.8	Divergence & Stokes theorems
*******	Wednesday, May 15	**Final Exam---1pm-2:50pm**	

*** April 12 is the last day to withdraw ***

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)

Math 173—Calculus III
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.