**MATH 2411: Calculus II**

**Department of Mathematical and Statistical Sciences**

**College of Liberal Arts and Sciences, University of Colorado Denver**

**COURSE SYLLABUS**

Instructor: Heather Killeen

Term: Spring 2019

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Class Meeting Days: Mondays, Tuesdays, Wednesdays & Fridays

Class Meeting Times: See Bear Creek High School Bell Schedule for modified block schedule

Location: N208

Office Hours: Tuesday/Thursday Access Periods, every 7th period

COURSE OVERVIEW

**I. Course Description**

The second of a three-semester sequence (MATH 1401, 2411, 2421) in Calculus. This mathematics course also fulfills the CORE University requirement for mathematics. The topics include exponential, logarithmic and trigonometric functions, techniques of integration, indeterminate forms, improper integrals, sequences, infinite series and polar calculus. Applications are emphasized. ***Semester Hours:*** *4*

**II. Course Prerequisites**

It must be assumed that every student has a good understanding and a working knowledge of college algebra, trigonometry and first semester calculus. MATH 1401 or a comparable course is required.

**III. Course Rationale**

This course is designed to build upon beginning integration techniques developed in Calculus I and lead toward the use of integration in several different applications and settings. Theory is also emphasized particularly within the study of sequences and infinite series.

**IV. Required Texts and Materials**

Larson, Hostetler Edwards, Calculus. 9th Edition. Boston, MA: Houghton Mifflin Company, 2010

 TI-83, preferably TI 84

**V. Colorado Commission on Higher Education Learning Objectives** The Colorado Commission on Higher Education has approved MATH 2411 for inclusion in the Guaranteed Transfer (GT) Pathways program in the GT-MA1 category. For transferring students, successful completion with a minimum grade of C- grade guarantees transfer and application of credit in this GT Pathways category. For more information on the GT Pathways program, go to <http://highered.colorado.gov/academics/transfers/gtpathways/curriculum/html>.

**GT Pathways Mathematics (GT-MA1) Content Criteria:**

a) Demonstrate good problem-solving habits, including:

 • Estimating solutions and recognizing unreasonable results.

 • Considering a variety of approaches to a given problem, and selecting one that is appropriate.

 • Interpreting solutions correctly.

b) Generate and interpret symbolic, graphical, numerical, and verbal (written or oral) representations of mathematical ideas.

c) Communicate mathematical ideas in written and/or oral form using appropriate mathematical language, notation, and style.

d) Apply mathematical concepts, procedures, and techniques appropriate to the course.

e) Recognize and apply patterns or mathematical structure.

f) Utilize and integrate appropriate technology.

**GT Pathways Mathematics (GT-MA1) Competencies:**

**A. Quantitative Literacy**: Competency in quantitative literacy represents a student’s ability to use quantifiable information and mathematical analysis to make connections and draw conclusions. Students with strong quantitative literacy skills understand and can create sophisticated arguments supported by quantitative evidence and can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc.).

Students should be able to:

**1. Interpret Information**.

a. Explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).

**2. Represent Information**.

a. Convert information into and between various mathematical forms (e.g., equations, graphs, diagrams, tables, words).

**3. Perform Calculations**.

a. Solve problems or equations at the appropriate course level.

b. Use appropriate mathematical notation.

c. Solve a variety of different problem types that involve a multi-step solution and address the validity of the results.

**4. Apply and Analyze Information**

a. Make use of graphical objects (such as graphs of equations in two or three variables, histograms, scatterplots of bivariate data, geometrical figures, etc.) to supplement a solution to a typical problem at the appropriate level.

b. Formulate, organize, and articulate solutions to theoretical and application problems at the appropriate course level.

c. Make judgments based on mathematical analysis appropriate to the course level.

**5. Communicate Using Mathematical Forms.**

a. Express mathematical analysis symbolically, graphically, and in written language that clarifies/justifies/summarizes reasoning (may also include oral communication).

**B. Problem Solving**: Competency in problem solving represents a student’s ability to design, evaluate, and implement a strategy to answer a question or achieve a goal.

Students should be able to:

**1. Define a Problem**.

a. Construct a detailed and comprehensive problem statement or goal.

b. Identify relevant contextual factors.

**2. Propose a Strategy**.

a. Identify reasonable approaches to solving the problem within the given context.

**3. Evaluate Potential Strategies**.

a. Provide an evaluation of the potential strategy(ies) which may include:

 i. the history of the problem,

 ii. the logic behind the potential strategy(ies),

 iii. the feasibility of the proposed strategy(ies), and

 iv. the potential impacts of the proposed strategy(ies).

b. Choose a feasible strategy.

**4. Apply a Strategy**.

a. Implement chosen approach(es).

b. Gauge success of the chosen strategy(ies) and revise as needed.

**VI. Course Goals and Learning Objectives**

**CORE Learning Outcomes**

1. ***Calculate***: Accurately and logically manipulate a mathematical representation to attain desired information.

2. ***Represent*:** Able to translate between representations to clearly represent information and gain insight. Representations may be expressed symbolically, graphically, numerically, or verbally.

3. ***Interpret:*** Draw meaningful inferences and communicate insights from mathematical representations.

Mathematical representations may include statistical, graphical, algebraic, geometric, or symbolic.

4. ***Model:*** Develop and/or apply an appropriate mathematical model for a real-world problem. This can be demonstrated by e.g. developing a model, choosing an appropriate model from several, or explaining the primary assumptions needed to use a particular model.

**Course Learning Outcomes MATH 2411**

The following section lists the Learning Outcomes specific to the course (MATH 2411). Each Learning Outcome reflects one or more of the CORE Learning Outcomes.

Students will be able to…

***1. Velocity & Net Change***

-Calculate displacement and distance traveled from a velocity curve. ***(Calculate)***

-Determine a position function given a velocity function and an initial position. ***(Represent)***

***2. Regions Between Curves***

-Sketch a region bounded by two curves and find its area. ***(Calculate)***

-Sketch a compound region bounded by two curves and find its area by integrating with respect to x or with respect to y. ***(Calculate)***

***3. Volume by Slicing***

-Use the general slicing method to find the volume of simple solids. ***(Calculate)***

-Use the disk method to find the volume of a solid generated when a region is revolved about the x-axis or y-axis. ***(Calculate)***

-Use the washer method to find the volume of a solid generated when a region is revolved about the x-axis or y-axis. ***(Calculate)***

-Find the volume of a solid of revolution formed when a region is revolved about a line other then the x-axis or y-axis. ***(Calculate)***

***4. Volume by Shells***

-Use the shell method to find the volume of a solid generated by revolving a region about the x-axis, y-axis or some other line. ***(Calculate)***

***5. Length of Curves***

-Set up and simplify the integral (with respect to x or with respect to y) that gives the length of a curve on a given interval. ***(Represent)***

-Find the arc length for simple curves by hand on a given interval. ***(Calculate)***

-Use technology to find the arc length of any curve on a given interval. ***(Calculate)***

***6. Surface Area***

-Find the area of a surface generated when a given curve is revolved about the x-axis or y-axis. ***(Calculate)***

***7. Physical Applications***

-Find the mass of a thin bar with a given density function. ***(Model)***

-Calculate the work required to stretch a spring a certain distance from equilibrium. ***(Calculate)***

-Solve ‘work’ problems related to conical tanks, cylinders, trapezoidal troughs and other figures. ***(Model)***

***8. Hyperbolic Funcions***

-Compute derivative of hyperbolic functions. ***(Calculate)***

-Compute the derivative of inverse hyperbolic functions. ***(Calculate)***

-Determine definite and indefinite integrals for hyperbolic functions. ***(Represent)***

***9. Basic Approaches***

-Compute definite and indefinite integrals by using substitution, subtle substitutions, completing the square and division with rational functions. ***(Calculate)***

***10. Integration by Parts***

-Compute definite and indefinite integrals using integration by parts. ***(Calculate)***

-Compute definite and indefinite integrals using repeated integration by parts. ***(Calculate)***

-Use reduction formulas to evaluate indefinite integrals. ***(Represent)***

***11. Trigonometric Integrals***

-Evaluate integrals involving powers of sin(x) and cos(x). ***(Calculate)***

-Evaluate integrals involving products of powers of sin(x) and cos(x). ***(Calculate)***

-Evaluate integrals involving powers of tan(x), sec(x), cot(x) and csc(x). ***(Calculate)***

**12. *Trigonometric Substitutions***

-Evaluate definite and indefinite integrals using trigonometric substitutions of the form $x=a sin⁡(θ)$, $x=a tan⁡(θ)$ and $x=a sec⁡(θ)$. ***(Calculate)***

***13. Partial Fractions***

-Give the partial fraction decomposition for simple linear factors, repeated linear factors and simple irreducible quadratic factors. ***(Represent)***

-Evaluate integrals using partial fraction decompositions. ***(Calculate)***

***14. Other Integration Strategies***

-Use a table of integrals to evaluate indefinite integrals. ***(Calculate)***

***15. Numerical Integration***

-Use the Midpoint Rule, Trapezoid Rule and Simpsons Rule to approximate integrals with a specified number of subintervals. ***(Calculate)***

***16. Improper Integrals***

-State when improper integrals diverge (when one bound is infinite). ***(Represent)***

-Evaluate improper integrals that converge (when one bound is infinite). ***(Calculate)***

-Evaluate improper integrals with unbounded integrands or state that they diverge. ***(Calculate)***

***17. Intro to Differential Equations***

-Solve initial value problems. ***(Calculate)***

-Find the general solution for first-order linear equations. ***(Represent)***

-Find the general solution for separable differential equations. ***(Represent)***

-Determine whether an equation is separable and if so, solve the given initial value problem. ***(Interpret)***

-Match an equation with its direction field. ***(Interpret)***

***18. Sequence & Series Overview***

-Write out the first few terms of an infinite sequence. ***(Represent)***

-Write out the first few terms of an infinite sequence defined by a recurrence relation. ***(Represent)***

-Find a recurrence relation that generates a given sequence. ***(Represent)***

-Find an explicit formula for the nth of a given sequence. ***(Represent)***

-Determine whether given sequences converge or diverge. If they converge determine what the sequence converges to. ***(Interpret)***

-Find the first four terms of the sequence of partial sums given and infinite series. ***(Represent)***

-Use partial sums to make a conjecture about the value of an infinite series. ***(Interpret)***

***19. Sequences***

-Find the limit of a sequence or determine that the limit does not exist. ***(Calculate)***

-Use the squeeze theorem to find the limit of a given sequence or stat that the sequence diverges. ***(Represent)***

***20. Infinite Series***

-Evaluate geometric sums. ***(Calculate)***

-Evaluate geometric series or state that they diverge. ***(Calculate)***

-Evaluate geometric series with alternating signs or state that they diverge. ***(Calculate)***

-Write repeating decimals as a geometric series and then as a fraction. ***(Represent)***

-Determine whether telescoping series converge or diverge. ***(Interpret)***

***21. Divergence & Integrals***

-Use the divergence test to determine whether a given series diverges (or whether the test is inconclusive). ***(Interpret)***

-Use the integral test to determine the convergence or divergence of a given series (or stat that the test does not apply). ***(Interpret)***

-Use the p-series test to determine whether given series converge or diverge. ***(Interpret)***

***22. Ratio, Root, and Comparison Tests***

-Use the ratio test, root test and comparison test to determine whether a given series converges. ***(Interpret)***

***23. Alternating Series***

-Use the alternating series test to determine whether a given series converges. ***(Interpret)***

-Determine whether a given series converges absolutely, converges conditionally or diverges. ***(Interpret)***

***24. Approximating Functions with Polynomials***

-Find linear and quadratic approximating polynomials for a given function centered at a given point. ***(Represent)***

-Find the nth-order Taylor polynomial for a given function centered at 0. ***(Represent)***

-Find the nth-order Taylor polynomial for a given function that is not centered at 0. ***(Represent)***

-Use a Taylor polynomial to approximate a given quantity (ex. $e^{.12}$, ln(1.05), cos(-.2), etc.). ***(Calculate)***

***25. Properties of Power Series***

-Determine the radius of convergence for a given power series and test the endpoints to determine the interval of convergence. ***(Calculate)***

-Find the function represented by a given series. ***(Represent)***

***26. Taylor Series***

-Write the first four terms of a Maclaurin series for a given function and write this power series in summation notation. ***(Represent)***

-Find the first four terms of a Taylor series centered at some value a and then write the power series using summation notation. ***(Represent)***

***27. Working with Taylor Series***

-Evaluate limits of functions using Taylor Series. ***(Calculate)***

-Given a function f(x), write the Taylor Series for the function centered about some value a and then differentiate the Taylor Series to find the derivative. ***(Represent)***

-Identify functions represented by given power series in summation notation. ***(Represent)***

***28. Polar Coordinates***

-Graph points in polar coordinates. ***(Represent)***

-Convert points from Cartesian coordinates to polar coordinates and vice-versa. ***(Calculate)***

-Sketch and name given polar curves. ***(Represent)***

***29. Calculus in Polar***

-Find the slope of the line tangent to a polar curve at a given point. ***(Calculate)***

-Find the area of a given region for a polar curve. ***(Calculate)***

**VII. Course Schedule:** I will keep a weekly calendar in our classroom and on my website. If the schedule changes, I will update both in a timely fashion.

**VIII. Assignments**

**Exams: Exams/Quizzes:** A student will be allowed to make up a test or quiz if their absence is unexcused. HOWEVER, the student will take the assessment on the next day that they show up to class and a penalty of one letter grade will be deducted from the students score. This is in accordance with the Jefferson County School district policy.

**Homework Assignments:** Assignments will be given daily (with few exceptions) and quizzes may happen without prior notice. Assignments are to be handed in the day they are due. Late work will be accepted in all cases when an absence is excused for full credit if and only if they are turned in within two days of the absence. Late work will be accepted from students due to an unexcused absence for partial credit if and only if the assignment is turned in by the date communicated to the student.

**VIII. Grading Summary** 20% Final

 60% Exams

10% Assignments

 10% Quizzes and Projects

**Grading Scale:**

90%-100% A

 80%-89% B

 70%-79% C

 60%-69% D

 -- 59% F

**COURSE PROCEDURES**

**IX. Course Policies – Grades Attendance Policy:**  Attendance and participation are required to be successful in this course. The BCHS Attendance policy will be strictly enforced.

**Extra Credit Policy**: Extra credit will not be offered, with the exception of bonus problems given on exams. Exam bonuses will be given at the discretion of the instructor and will be labeled as such.

**Incomplete Policy**: Incomplete grades (I) are not granted for low academic performance.  To be eligible for an Incomplete grade, students must (1) *successfully* complete at least 75 percent of the course, (2) have special circumstances (verification may be required) that preclude the student from attending class and completing graded assignments, and (3) make arrangements to complete missing assignments with the original instructor using a CLAS Course Completion agreement.

**X. Course Policies – Technology and Media Email –** Students can communicate with me regarding attendance, meeting arrangements, grades, and/or questions regarding the course content, assignments, and due dates.

**Computing Technology –** During the semester, we will explore in this class graphically, numerically, and algebraically. This course will utilize the TI-84 calculator, with graphics capability, to facilitate the study of calculus. This calculator is a requirement, it will be used in class on a daily basis and on some exams, and will help in the learning of calculus.

**XI. Getting Help Instructor Office Hours/By Appointment** Feel free to see me with questions not answered during lecture, additional explanation, or homework assistance.

**XII. Academic Honesty** Students are required to know, understand, and comply with the CU Denver Academic Dishonesty Policy as detailed in the Catalog and on the CLAS website. Academic dishonesty consists of plagiarism, cheating, fabrication and falsification, multiple submission of the same work, misuse of academic materials, and complicity in academic dishonesty. If you are not familiar with the definitions of these offenses, go to
[http://www.ucdenver.edu/academics/colleges/CLAS/faculty-staff/policies/Pages/DefinitionofAcademicDishonesty.aspx](https://webmail.ucdenver.edu/owa/redir.aspx?C=BfBWQwuda0CUVe6g28JkZBZvKxcFx89IJ1lXMnn5FaKv7PlETK7UuHK7os2Vu4AzvjxWF7A5b5g.&URL=http%3a%2f%2fwww.ucdenver.edu%2facademics%2fcolleges%2fCLAS%2ffaculty-staff%2fpolicies%2fPages%2fDefinitionofAcademicDishonesty.aspx).
This course assumes your knowledge of these policies and definitions. Failure to adhere to them can result in possible penalties ranging from failure of this course to dismissal from the University; so, be informed and be careful. If this is unclear to you, ask me. The College of Liberal Arts and Sciences (CLAS) Ethics Bylaws allow the instructor to decide how to respond to an ethics violation, whether by lowering the assignment grade, lowering the course grade, and/or filing charges against the student with the Academic Ethics Committee. Violating the Academic Honor Code can lead to expulsion from the University.

**Definition of Academic Dishonesty** Students are expected to know, understand, and comply with the ethical standards of the University. In addition, students have an obligation to inform the appropriate official of any acts of academic dishonesty by other students of the University. Academic dishonesty is defined as a student's use of unauthorized assistance with intent to deceive an instructor or other such person who may be assigned to evaluate the student’s work in meeting course and degree requirements. Examples of academic dishonesty include, but are not limited to, the following:

**Plagiarism:** Plagiarism is the use of another person’s distinctive ideas or words without acknowledgment. The incorporation of another person’s work into one’s own requires appropriate identification and acknowledgment, regardless of the means of appropriation. The following are considered to be forms of plagiarism when the source is not noted:

1. Word-for-word copying of another person's ideas or words.
2. The mosaic (the interspersing of one’s own words here and there while, in essence, copying another's work).
3. The paraphrase (the rewriting of another’s work, yet still using their fundamental idea or theory).
4. Fabrication of references (inventing or counterfeiting sources).
5. Submission of another’s work as one's own.
6. Neglecting quotation marks on material that is otherwise acknowledged.

Acknowledgment is not necessary when the material used is common knowledge.

**Cheating:** Cheating involves the possession, communication, or use of information, materials, notes, study aids or other devices not authorized by the instructor in an academic exercise, or communication with another person during such an exercise. Examples of cheating are:

1. Copying from another's paper or receiving unauthorized assistance from another during an academic exercise or in the submission of academic material.
2. Using a calculator when its use has been disallowed.
3. Collaborating with another student or students during an academic exercise without the consent of the instructor.

**Fabrication and Falsification:** Fabrication involves inventing or counterfeiting information, i.e., creating results not obtained in a study or laboratory experiment. Falsification, on the other hand, involves deliberately alternating or changing results to suit one’s needs in an experiment or other academic exercise.

**Multiple Submissions:** This is the submission of academic work for which academic credit has already been earned, when such submission is made without instructor authorization.

**Misuse of Academic Materials:** The misuse of academic materials includes, but is not limited to, the following:

1. Stealing or destroying library or reference materials or computer programs.
2. Stealing or destroying another student’s notes or materials, or having such materials in one’s possession without the owner’s permission.
3. Receiving assistance in locating or using sources of information in an assignment when such assistance has been forbidden by the instructor.
4. Illegitimate possession, disposition, or use of examinations or answer keys to examinations.
5. Unauthorized alteration, forgery, or falsification.
6. Unauthorized sale or purchase of examinations, papers, or assignments.

**Complicity in Academic Dishonesty:** Complicity involves knowingly contributing to another’s acts of academic dishonesty.

**Student Code of Conduct:** As members of the University community, students are expected to uphold university standards, which include abiding by state civil and criminal laws and all University policies and standards of conduct. These standards are outlined in the student code of conduct which can be found at:
 <http://www.ucdenver.edu/life/services/standards/students/Pages/default.aspx>

**Spring 2019 Schedule and Deadlines\***

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| --- | --- |
| **Monday****1/7/19** | **Registration Opens:**You may begin your application and registration for your Fall 2018 CU Succeed Courses. Please refer to the CU Succeed Website for detailed instructions and links. |
| **Wednesday****2/6/19** | **Last Day to Request to Register:**Registration must be completed no later than this day. **If you do not complete the form by this day, you will not receive credit. *There will be no exceptions.*****CU Succeed Parent/Guardian Financial Responsibility Form due:**Turn in Financial Responsibility Form to your teacher by this day. |
| **Monday****2/25/19** | **Last Day to Drop:**Courses dropped by this date will not appear on your CU Academic Record and you will not be responsible for the tuition. You must return a drop form to our office by this day.Drop instructions are on the CU Succeed Website. |
| **Monday****3/18/19** | **Last Day to Withdraw:**You will be responsible for tuition payment and the course will appear on your CU Academic Record as a ‘W’.Withdraw instructions are on the CU Succeed Website. |
| **Wednesday****3/29/19** | **Tuition Due:**Payment instructions are located on the CU Succeed Website. A reminder e-mail will be sent to the e-mail supplied on the application; **bills will not be mailed!** |

**Note: Grades will be recorded on an official CU transcript, and will become a part of the student’s permanent academic record at the University of Colorado. Grades and transcripts will be available by the end of June 2019.**

***Have questions? Contact us!***

CU Succeed Programs

[**www.ucdenver.edu/cusucceed**](http://www.ucdenver.edu/cusucceed)

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\*The CU Succeed Office holds the right to make extensions and adjustments. Exceptions to deadlines will NOT be honored.