Term Information

Effective Term	Autumn 2017

General Information

Course Bulletin Listing/Subject Area	Mathematics
Fiscal Unit/Academic Org	Mathematics - D0671
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	1141
Course Title	Calculus with Review II
Transcript Abbreviation	Calc with Rev II
Course Description	This is the second of a two semester course sequence. The topics covered in Math 1141 will include differential calculus of one real variable, with review of important algebra and pre-calculus concepts. Math 1141 is a course designed with an emphasis on reviewing these fundamental pre-calculus skills as they apply to calculus.
Semester Credit Hours/Units	Fixed: 4

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Recitation, Lecture
Grade Roster Component	Recitation
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	A grade of C- or above in 1140.
Exclusions	Not open to students with credit for 1151 or above, or 151.xx, or above.

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	27.0101
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore

Requirement/Elective Designation

General Education course:
Mathematical or Logical Analysis

Course Details

Course goals or learning objectives/outcomes

- Demonstrate a thorough understanding of calculus concepts both graphically and analytically
- Demonstrate a conceptual understanding and computational proficiency of single variable differential calculus.
- To demonstrate relevant applications of mathematical principles by modelling problems arising in a variety of disciplines using calculus and analyzing their solutions.

Content Topic List

- Revisit limits and definition of derivatives.
- Linear approximation.
- Implicit differentiation.
- Logarithmic differentiation.
- Inverse trigonometric functions and their derivatives.
- L'Hopital's rule.
- Introduction to Riemann Sums.
- Definition of integrals.
- Fundamental Theorem of Calculus.
- Integration by substitution.

Attachments

- Math 1141 tentative syllabus.docx: Syllabus
  (Syllabus. Owner: Husen,William J)
- Math 1141 weekly topics.docx: Weekly calendar
  (Other Supporting Documentation. Owner: Husen,William J)
- Calculus with Review Sequence.docx: Course rationale statement
  (Cover Letter. Owner: Husen,William J)
- Welcome.docx: Welcome letter to students
  (Other Supporting Documentation. Owner: Husen,William J)
- Math 1141 GE Rationale.docx: GE rationale statement
  (GEC Model Curriculum Compliance Stmt. Owner: Husen,William J)
- Math 1141 GE Assesment.docx: GE assessment plan
  (GEC Course Assessment Plan. Owner: Husen,William J)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Husen,William J	11/18/2016 12:21 PM	Submitted for Approval
Approved	Husen,William J	11/18/2016 12:21 PM	Unit Approval
Approved	Haddad,Deborah Moore	11/19/2016 04:20 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler Hogle,Danielle Nicole	11/19/2016 04:20 PM	ASCCAO Approval

Welcome to Calculus with Review!

Words of Encouragement:

Mathematics can be a difficult subject to learn and an even harder one to master. A common misconception is that people either "get" math or they do not. In reality, learning math can be fun! It "merely" takes time, dedication, and practice. If you do not understand a concept, you are in the same boat with most other students. The role of your lecturer and TA is to help everyone understand the material and to help individual students iron out any specific difficulties that arise while working the course exercises.

Studies have shown that both failing and successful calculus students believe they can succeed if they try hard and put equal amounts of time into the course. However, successful students know where and when to get help, study by searching for overall patterns and relationship amongst problems rather than just repeatedly doing examples, and use their time more effectively to study.

In most traditional calculus courses, many students struggle with important algebra and pre-calculus concepts. Calculus with Review I is a course designed with an equal emphasis on reviewing and developing these fundamental pre-calculus skills as they apply to calculus. During the course of the semester, many students may wish to take advantage of this integrated approach and join this course.

From the OSU Math Department:

The Math Department has worked very hard to design this course to meet the following goals:

1. To develop a thorough understanding of calculus concepts both graphically and analytically
2. To develop a conceptual understanding and computational proficiency of single variable differential calculus.
3. To demonstrate relevant applications of mathematical principles by modelling problems arising in a variety of disciplines using calculus and analyzing their solutions.

Philosophy of Assessment:

Mathematics is a field full of conceptual richness and practical applications. While the practical application of mathematical concepts is extremely important, a conceptual understanding is imperative in order to use mathematics as an effective tool. The course assessment material will contain both computational questions as well as problems that require you to demonstrate your conceptual understanding of the material.

All of the course practice has been designed with the aforementioned goals and assessment philosophy in mind. There is ample practice material available on Canvas in the worksheets, recitation handouts, and sample exams. This material will serve as the basis for the

assessments (quizzes and exams) for this semester. We have worked very hard to create this material, and we hope that you utilize it diligently.

Learning Path:

The following is a recommended strategy for learning the course material:

1. Attend lecture and recitation. Take good notes and ask your instructor about anything you do not understand. Spending a short amount of time before lecture skimming the section to be covered that day is highly recommended!
2. The same day that you learn a new concept, work a few problems from the worksheets, your Ximera assignments, or the recitation handouts to make sure you can do problems. The only way to learn math is to do math!
3. Work all of the problems on the worksheets. These problems along with the Ximera homework questions will serve as the basis for your quiz and exam questions! In addition, detailed step-by-step solutions are provided for every problem!
4. If there is anything you do not understand from the worksheets, homework or recitation handouts, ask your TA or recitation instructor!

When working problems and reviewing your notes, you should search for overall patterns and relationships amongst problems rather than just repeatedly doing examples!

General Advice:

- Do not fall behind or rush through the assignments. If you get stuck, take a step back and evaluate how you are thinking about the problem, and don't be bashful about asking questions!
- Log into Carmen every weekday for announcements and discussion posts.

Tentative Syllabus: Math 1141 - Calculus with Review II, Spring 2018

Course Description:

This is the second of a two semester course sequence. This semester, topics covered will include differential calculus of one real variable and introductory integral calculus, with review. In most traditional calculus courses, many students struggle with important algebra and pre-calculus concepts. Calculus with Review II is a course designed with an emphasis on reviewing these fundamental pre-calculus skills as they apply to calculus. At the end of the course semester, students will take a comprehensive final exam covering the material from both this semester and last semester. The material from last semester will be incorporated throughout the semester.

Course Materials:

Required Text: Ximera custom online textbook

Optional Text: Printed text for "Ximera custom online textbook"

How to get help in this course:

INSTRUCTOR INFORMATION (fill in for your specific instructors):

Lecturer:

Office:

Office Hours:

Email:

TA:

Office:

Office Hours:

Email:

MSLC Free Tutoring Hours:

The Mathematics and Statistics Learning Center offers free tutoring services during the semester in <INSERT HERE>. For information about hours, please go to: <link here!>

Course Prerequisites:

A grade of C- or above in Math 1140. Not open to students with credit for Math 1151 or above or Math 151.xx, or above.

GE Information:

Goals

Students develop skills in quantitative literacy and logical reasoning, including the ability to identify valid arguments, and use mathematical models.

Expected Learning Outcomes

1. Students comprehend mathematical concepts and methods adequate to construct valid arguments.
2. Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning
3. Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.

Course Learning Objectives:

This is the second course of a two-semester sequence. Upon successful completion of the two courses, students will be able to:

1. Demonstrate a thorough understanding of calculus concepts both graphically and analytically
2. Demonstrate a conceptual understanding and computational proficiency of single variable differential calculus.
3. To demonstrate relevant applications of mathematical principles by modelling problems arising in a variety of disciplines using calculus and analyzing their solutions.

Course Structure:

Lectures:

On Mondays and Wednesdays, you will attend lectures in which fundamental skills are reviewed and new topics in calculus are presented.

Recitations:

On Tuesdays and Thursdays, you will attend recitation on the previous day's lesson. This is where you can ask questions about the course material you have learned and attempt exam-level questions.

Grades

Assignment or category	Points
Final Exam	**200**
Midterms (100 each)	**300**
Quizzes (10)	**80 (10 points each, drop 2)**
Mastery Quiz	**30**

Homework (26)	**50 (up to 2 bonus points)**
Projects (3)	**40**
Total	**700**

Grading Scale:

A	Above 90	B-	77-80	D+	63-67
A-	87-90	C+	73-77	D	60-63
B+	83-87	C	70-73	E	Below 60
B	80-83	C-	67-70		

This grading scale will not be raised. Individual assignments, including exams, will not be curved, but the final grading scheme could be adjusted at the ***end*** of the semester. Class participation and effort will be important factors in decisions about borderline grades.

Exams:

Exams will consist of true/false, multiple choice, short answer, and free-response problems. The exams will be common evening exams given outside of regular class time. The location of the exams will be announced one week before each midterm.

Exam	Date and time	Make-Up
Midterm 1	Wednesday, January 1	Thursday, February 1
Midterm 2	Wednesday, February 28	Thursday, March 1
Midterm 3	Wednesday, April 4	Thursday, April 5
Final Exam	TBD	TBD

It is your responsibility to check Carmen regularly. Any material posted there should be considered important for quizzes and exams.

Make-up Policy:

Makeup exam will only be given in extraordinary circumstances. Excuses due to illness should be accompanied by a doctor's note. Students should contact their instructor as soon as possible in the event a makeup is needed and should always contact the instructor before the exam is given. Documentation of the emergency is required in order for make-up exams and quizzes to be considered for credit.

Calculator Policy:

Calculators will NOT be permitted during exams and quizzes. Cell phones and web-enable devices are also prohibited during exams.

Quizzes:

Quizzes will be given in recitation and are worth 10 points each. Each quiz will cover both conceptual and computational questions! Some quizzes may have a take-home component as well as an in-class component. The date and sections covered for each quiz is listed on the calendar. You may drop your low two quiz scores.

Mastery Quiz:

There will be a comprehensive mastery quiz given at the beginning of Week 2 that will cover the material from the previous semester. This material will be covered in the first week of the course. Students must score at least a 75% on this quiz to receive credit for it. If a student fails to earn a 75%, he or she may take the quiz once per week until this score is achieved. If this quiz is retaken, the student will earn a maximum of 75%. If the student fails to earn a 75% by the end of the course, the student will not pass the course.

Homework:

There are 26 online homework assignments conducted through Ximera. Each assignment will count as 2 points towards the final course grade. There are 52 total points available through the online homework, though your final homework grade will be out of 50 points. Any points earned over the 50 points will count as extra credit towards your final course grade.

Homework will be due every Tuesday and Friday night by 11:59 PM. The breakdown of the content of the homework assignments will be roughly:

1. 60% material covered since the previous assignment.
2. 20% material covered on the previous assignment.
3. 20% material that either reviews fundamental pre-calculus skills, revisits previous topics from the course, or synergizes material learned at various stages of the course.

The homework is designed to promote a continued review and mastery of all course material.

Students who enter the course after the third week will have to make up all previous assignments by the first exam.

Projects:

There will be three projects that explore the course material more deeply and incorporate technology into the course. You will be allowed (and are thus encouraged) to work in groups on these!

Other Course Policies

Technology Problems:

It is inevitable that technology will sometimes malfunction. Students are responsible for beginning assignments early enough to have time to ask for help with technical issues. Although reasonable accommodations for students when there are technical issues, the student will be responsible for

documenting errors and seeking help in a timely fashion from both technical support and the instructor as needed. No accommodations will be made for students who do not work actively to resolve their technical problems in a timely fashion.

Student participation expectations:

You are expected to check Carmen at least **once every 24 hours on weekdays**. You should plan on working on this course every school day. There are frequent deadlines in this course, and students are expected to keep track of all deadlines. Students are expected to work ahead of those deadlines whenever possible to prevent last-minute problems. Students are expected to attend all recitation meetings.

Academic Misconduct Statement:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee. For additional information, see http://studentaffairs.osu.edu/resource_csc.asp

Accommodations for accessibility

Requesting accommodations

Students with disabilities that have been certified by the Office of Student Life Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located at 098 Baker Hall, 113 W. 12th Ave; telephone (614) 292-3307 and VRS (614) 429-1334; Webpage: http://www.ods.osu.edu

Tentative Weekly Schedule: Math 1141 - Calculus with Review II, Spring 2018

Week 1:

We discuss limits and derivatives, including motivation and applications such as optimization.

Precalculus Emphasis: Functions, polynomials, simplifying rational expressions

Week 2:

Seeing that the tangent line lies close to the graph, we develop the notion of linear approximation. We then see how information from the first and second derivatives allows us to sketch an accurate graph of the function.

Precalculus Emphasis: Solving equations, inequalities, graphs of functions, equations of lines, quantitative reasoning

Week 3:

We spend a little more time graphing more complicated functions, then discuss Implicit Differentiation, a method for calculating the derivative of implicitly defined functions.

Precalculus Emphasis: Inequalities, graphs of functions, solving formulas, quantitative reasoning

Week 4:

We discuss one more technique of differentiation, Logarithmic Differentiation. We then review for the first midterm of the semester.

Precalculus Emphasis: Inverse functions, properties of logarithms and exponentials

Week 5:

We discuss the inverse trigonometric functions and their derivatives, as well as derivatives of inverse functions in general.

Precalculus Emphasis: Trigonometry, inverse trigonometric functions, inverse functions, trigonometric identities, graphical reasoning

Week 6:

The interpretation of derivatives as measuring `rates of change', along with our work on Implicit Differentiation, leads us to Related Rates.

Precalculus Emphasis: co-variation of quantities, function composition, trigonometry, areas and volumes of common geometric shapes

Week 7:

Since derivatives were defined in terms of limits, they can occasionally be useful in evaluating limits. We study L'Hopital's Rule for evaluating indeterminate forms.

Precalculus Emphasis: Domains, vertical asymptotes, graphical and analytical reasoning, exponentials, properties of logarithms

Week 8:

We have spent a lot of time learning how to take the derivative of a function. We begin the week by asking the reverse question, ``What function has this as its derivative?" That is, we talk about antiderivatives. We then review for our second midterm.

Precalculus Emphasis: Rational functions, distributive laws

Week 9:

We use rectangles to approximate the area under a curve. Then we define the definite integral and approximate it using a small number of rectangles.

Precalculus Emphasis: Analytic geometry, simplifying expressions, distributive laws

Week 10:

We introduce sigma notation to help with our area approximations. This allows us to use MANY rectangles in the approximations, giving us more accurate results. Then we see what happens as we take the limit.

Precalculus Emphasis: Summation notation, analytic geometry, simplifying expressions

Week 11:

The Fundamental Theorem of Calculus (in two forms).

Precalculus Emphasis: Definition of functions, simplifying expressions, function composition

Week 12:

Definite integrals have many applications. We discuss some of these, then review for Midterm 3.

Precalculus Emphasis: Quantitative reasoning, even and odd functions

Week 13:

We discuss our main integration technique, substitution, for both indefinite and definite integrals.

Precalculus Emphasis: Function composition, simplifying expressions, domains, transformations

Week 14:

We review for the cumulative final exam.

Calculus with Review Sequence
Rationale

It is well known that many students struggle in calculus due to poor understanding of required prerequisite knowledge. Moreover, many students who have taken a precalculus class in high school do not place into calculus on the OSU math placement exam. These students are required to repeat courses that they have taken, delaying their progress in math and possibly other required courses; however, for students who place at the lower to mid-range level of precalculus (level M on the math placement exam), a standard precaculus class (Math 1150) would be most appropriate.

Over the last year and a half, the Department of Mathematics has been involved in the redesign of calculus. Though these redesign efforts have been mainly focused on pedagogy, it became clear that there remain serious issues with student preparation for calculus, particularly for students at the lower end of calculus math placement level.

The Calculus with Review sequence is designed to address these issues by providing just-in-time remediation combined with well thought-out co-requisite strategies. It will be appropriate for students at the lower end of the calculus placement level, as well as students who would have been allowed in the past (by advisor approval) to move up to calculus even though their placement was lower (precalculus). The overall goal is to improve student success in calculus, and thereby improve student retention in STEM areas. This sequence is modeled on a similar calculus with review sequence at George Mason University (GMU), developed by Dr. Mary Nelson. The success of this sequence at GMU has been outstanding, in particular, the success rate (C- or better) in calculus for their lowest placing students went from 20% to 80% since this sequence has been implemented.

The sequence will consist of two 4 credit courses. The first course, Math 1140, will cover the first half of the material in Math 1151 (Calculus I), mixed with targeted precalculus review. The coverage of the calculus material in this first course will be necessarily less rigorous that that in Math 1151, but is designed to give a firm foundation to these topics which will be revisted in the second course. The prerequisites for Math 1140 will be the same as for Math 1151; however, students who place into precalculus (math placement level M) may be allowed into Math 1140 with math department approval after meeting with a math advisor and discussing their backgrounds.

The second course, Math 1141 will revisit all of the calculus topics from the first semester, building on their rigor (to the level of Math 1151), reinforcing the ideas and introduce the remaining topics from Math 1151. It is expected that much less precaclulus review will be needed in Math 1141; however, there will continue to be targeted precalculus reviews, particularly trigonometric ideas.

This sequence is designed to be appropriate as a prerequisite for calculus 2 (Math 1152 and Math 1172) in both rigor and challenge as well as appropriate for students taking calculus as a terminal math course.

Math 1141
GE Rationale Statement

GE Category: Quantitative Reasoning – Mathematical or Logical Analysis

Goals of the Quantitative Reasoning GE Category:

> Students develop skills in quantitative literacy and logical reasoning, including the ability to identify valid arguments, and use mathematical models.

Expected Learning Outcomes of the Mathematical of Logical Analysis GE Subcategory:

1. Students comprehend mathematical concepts and methods adequate to construct valid arguments.
2. Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning
3. Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.

Currently any math course at the level of Math 1116 or above, excluding Math 1125 and Math 1126 satisfy this GE subcategory. This course, Math 1141, is intended to as well.

1. How do the course objectives address the GE category expected learning outcomes?

The stated learning outcomes for Math 1141 are as follows:

1. Demonstrate a thorough understanding of calculus concepts both graphically and analytically
2. Demonstrate a conceptual understanding and computational proficiency of single variable differential calculus.
3. To demonstrate relevant applications of mathematical principles by modeling problems arising in a variety of disciplines using calculus and analyzing their solutions.

Students who successfully complete Math 1141 will be expected to have acquired these learning outcomes. In particular, as students develop a conceptual understanding of calculus as well as learning the computational proficiency required, they will be able to comprehend these mathematical concepts and the corresponding methods used to justify their work (i.e. constructing valid arguments). At the core of the calculus concepts is the idea of approximation and how to use these approximations to produce true values. This process requires both inductive and deductive reasoning to understand how this process works and how to apply it to situations. Finally, one of the principal focuses will be working with applied problems. Students are required to demonstrate their abilities to synthesize the calculus concepts that they have learned and produces solutions to essentially real world problems. In doing so, they will be able to demonstrate the applications of these mathematical concepts to the problems at hand.

2. How do the readings assigned address the GE category expected learning outcomes?

Students are required to read the text before each lecture. Traditionally this is something that is neglected by students and unenforced by instructors. In Math 1141, the text used is an open-source calculus textbook (Ximera) developed by the OSU Department of Mathematics. One of its features is a "fill-in" the text requirement. Students will be required to, in some sense, write part of the textbook themselves – to be done before class. Because of the nature of the material, students will clearly be required to understand the concepts of calculus and be able to construct parts of the elements of arguments used throughout. Moreover, students are expected to read over sample problems with their solutions. All such problems involve elements of inductive and deductive reasoning. Many of these problems are applied problems and the expectation is that students will rework these problems on their own.

3. How do the topics address the GE category expected learning outcomes?

Math 1141 covers approximately half of the topics in Math 1151 (calculus 1). Particularly additional topics in differential calculus, including applications of derivatives. Students that learn these topics develop a comprehension of mathematical concepts and should be able to construct a valid argument. Moreover, the reasoning required to bridge the various topics something to which the students will be exposed. Finally, a fundamental goal of calculus is to prepare students for further study in STEM areas. The topics in Math 1141 include applied problems and methods used to solve them. As such students are required to demonstrate their abilities to work through such modeling problems.

4. How do the written assignments address the GE category expected learning outcomes?

Students in Math 1141 will be required to work on a wide variety of problems, ones involving procedural skills, conceptual knowledge and applications. First and foremost, every student is required to justify their answers. This requires the student to be able to formulate a valid argument for a given problem. Moreover, problems involving conceptual ideas (as different from skills) generally require a student to deduce a correct answer from known facts – rather than simply implement an algorithm. Finally, many of the assigned questions are applied questions, including projects that students will be working on. Here students must be able to demonstrate their general problem solving skills in the context of real-world type problems.

Math 1141
GE Assessment Plan

Math 1141 will be primarily assessed through direct methods. A series of questions will appear on the final exam for this course, each of which will be mapped to a particular GE learning outcome. The results on each of these questions will be recorded separately and a percentage will be calculated for each student based on the total points for each of these questions. A GE outcome will be considered to be achieved if 70% of the students receive a 70% or higher on the corresponding final exam question. An aspirational standard will be set and actively pursued, namely 80% of students receiving an 80% or higher.

An additional measurement that will be used is a calculus knowledge assessment developed by the OSU Department of Mathematics. This multiple-choice exam will be given before the course begins and at the end of the course. It will not affect the students' grades, rather it will serve as an indicator of how well the students are developing their knowledge verses a known standard.

In order to assess Math 1141 as a whole, the course coordinator will closely monitor this course. They will regularly collect data including students' grades and the scores on the standardized before course-after course exam. Moreover, an additional indicator of success will be how well student knowledge is being improved as indicated by the calculus knowledge assessment before course-after course exam.

If the data indicate that there are weaknesses in Math 1141, then the course coordinator will bring this issue before the Undergraduate Committee in the Department of Mathematics for discussion. Any changes that are approved the committee will be implemented as appropriate.