

# UAF DMS Guidelines for

## MATH 230X – Essential Calculus with Applications

Across all sections of Math 230X offered by UAF campuses (delivered in person or online), all syllabi must minimally satisfy the following requirements.

1. General guidelines set by UAF; follow this link to the [UAF syllabus requirements](#)
2. GER Information (sample statement below):

This course is listed as a General Education Math Course as such this course is expected to meet the general learning outcomes 1 and 2.

1. Build knowledge of human institutions, sociocultural processes, and the physical and natural works through the study of mathematics. Competence will be demonstrated for the foundational information in each subject area, its context and significance, and the methods used in advancing each.
2. Develop intellectual and practical skills across the curriculum, including inquiry and analysis, critical and creative thinking, problem solving, written and oral communication, information literacy, technological competence, and collaborative learning. Proficiency will be demonstrated across the curriculum through critical analysis of proffered information, well-reasoned solutions to problems or inferences drawn from evidence, effective written and oral communication, and satisfactory outcomes of group projects.

3. Text: Mathematics with Applications in Business and Social Sciences by HAWKES Learning

- Chapter 10: 10.1-10.9 (r)
- Chapter 11: 11.1-11.6 (r)
- Chapter 12: 12.1-12.6 (r)
- Chapter 13: 13.1-13.6 (r), 13.5 (o)
- Chapter 14: 14.1-14.6 (r)
- Chapter 15: 15.1, 15.2, 15.4 (r), 15.3, 15.5, 15.6 (o)

4. Timing of material

For each of the following, the minimum time spent on the sections is listed.

This is a suggested outline with three exams. Modifications can be made if giving four exams.

Section Topic Approx. timing

10.1 One-sided Limits	1 day
10.2 Limits	1 day
10.4 More about Limits	½ -1 day
10.4 Continuity	1-1½ days
10.5 Average Rate of Change	1 day
10.6 Instantaneous Rate of Change	1 day
10.7 Definition of Derivative and Power Rule	1-1½ days
10.8 Techniques for Finding Derivatives	1 day
10.9 Applications: Marginal Analysis	1 day
Exam over Chapter 10	
11.1 Product and Quotient Rules	1 day
11.2 The Chain Rule and General Power Rule	1-1½ days
11.3 Implicit Differentiation and Related Rates	2 days
11.4 Increasing and Decreasing Intervals	1 day
11.5 Critical Points and the First Derivative Test	1 day
11.6 Absolute Maximum and Minimum	1 day
12.1 Concavity and Points of Inflection	1 day
12.2 The Second Derivative Test	1 day

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12.3 Curve Sketching: Polynomial Functions	1-1½ days
12.4 Curve Sketching: Rational Functions	1 day
12.5 Business Applications	1 day
12.6 Other Applications	1-2 days

Exam overs Chapters 11 and 12

13.1 Derivatives of Logarithmic Functions	1 day
13.2 Derivatives of Exponential Functions	1 day
13.3 Growth and Decay	1-1½ days
13.4 Elasticity of Demand	1 day
13.6 Differentials	1 day
14.1 The Indefinite Integral	1 day
14.2 Integration by Substitution	1 day
14.3 Area and Riemann Sums	1-2 days
14.4 Fundamental Theorem of Calculus	1 day
14.5 Area Under a Curve with Applications	1 day
14.6 Area Between Curves with Applications	1 day
15.1 Integration by parts	1 day
15.2 Annuities and Income Streams	1 day
15.4 Numerical Integration	1 day

Exam over Chapters 13, 14, and 15

Review Chapters 10-15

Final over Chapters 10-15

### 5. Types of Assessments

- Exams
  - at least two exams during the semester
  - exams must be timed, closed book, closed notes
  - exams should have some form of proctoring
  - use of non-graphing calculators is allowed on this course
  - exams must be majority written answer (not multiple choice)
  - exams must be paper-and-pencil exams, written and graded by faculty members
  - exams should not be reused from previous semesters, limited reuse of edited problems is acceptable
- Final Exam
  - must be cumulative and representative of the entire course
  - must include problems from each Assessment Criteria listed on the next page
  - Students are expected to know on their own (no formulas provided on the test for the following):
    - \* differentiation formulas
    - \* integration formulas
- Other Assessed Work
  - for online work through HAWKES, mastery level should be no less than 75%
  - instructors should provide written feedback to students approximately weekly throughout the semester; this can be through humanly-graded assignments or email correspondence

### 6. Grading Policy

- The syllabus must include a grading scale of some form.
- Plus/minus grading is at the discretion of the instructor, but must be stated explicitly.
- Withdrawal and Incomplete policies must be stated explicitly.
- The final grade in this course must adhere to the following:
  - Written Assessed Work at least 15% and at most 30%
  - Online Assessed Work at most 15%
  - Midterm Exams At least 35%
  - Comprehensive Final Exam At least 15%

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### 7. Tutoring Services

DMS Math and Stat Lab: If you need extra math help, there is free tutoring available. The Math and Stat Lab is located in CHAP 305 and is staffed by Math Graduate students, upper-division Math students and Math faculty. This lab operates on a walk-in basis and schedules are posted that provide tutor times.

DMS One-on-one Tutoring: Free tutoring by appointment. This service is available to any UAF student registered in a core MATH course. Tutoring is available in CHAP 210. Appointments can be made for 30 minutes or an hour and can be scheduled up to two weeks in advance. Students can sign up for an appointment at <https://fairbanks.go-redrock.com>

DMS Online Tutoring: Free tutoring available Monday - Saturday! This service is available to any UAF student registered in a MATH or STAT course. Tutoring is accessible through Zoom. Appointments can be made for 30 minutes or an hour and can be scheduled up to two weeks in advance. To schedule an appointment students can sign up for an appointment at <https://fairbanks.go-redrock.com>

## Assessment Criteria

Final exams should contain problems that demonstrate the students' acquired knowledge of the following topics.

- Fundamentals- Algebra
  - simplify algebraic expressions involving negative and fractional exponents, compound fractions, and rational expressions
  - solve a problem using modeling with equations (eg. area, length, mixtures, distance, or rate)
- Limits
  - evaluate a two-sided limit
  - evaluate a one-sided limit
  - evaluate an infinite limit
  - express with proper notation
  - find limits from graph
- Continuity
- Graphs
  - find domain and range
  - find intercepts
  - find critical and hypercritical points
  - find asymptotes
  - identify intervals where the function is increasing or decreasing
  - identify intervals where the function concave up or down
  - identify points that are extreme values or inflection points
- Differentiation and integration
  - understand and use basic properties
  - find derivatives of more complicated functions
    - \*Chain rule
    - \*Logarithmic Differentiation
  - find integrals of more complicated functions
    - \*Integration by Parts
    - \*Numerical Integration
  - understand the fundamental theorem of calculus
- Apply Derivatives to Applications (minimum of 2)
  - modeling with related rates
  - modeling with optimization
  - modeling with differentials

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- modeling with growth/decay
  - modeling with Elasticity
- Apply Integrals to Applications (minimum of 2)
  - modeling average value
  - modeling surplus
  - modeling growth/decay
  - modeling area
  - modeling rate of flow