UAF & DMS SYLLABUS GUIDELINES FOR MATH253X – CALCULUS III

Across all sections of Calculus III offered by UAF campuses (delivered in-person or online), all syllabi must satisfy the following requirements.

1. General guidelines set by UAF; follow this link to UAF syllabus requirements
2. Content
   - *Calculus: Early Transcendentals* (for Calculus I-III) or *Multivariable Calculus* (for Calculus III) by James Stewart, 8^{th} edition is the textbook adopted by DMS and must be used for the course.
   - All of the required (r) sections from the textbook listed below must be covered. Optional (o) topics should be considered as time permits.
     - Chapter 12: 12.1-12.6 (r)
     - Chapter 13: 13.1-13.2 (r), 13.3 (arc length (r), curvature (o)), 13.4 (r)
     - Chapter 14: 14.1-14.8 (r)
     - Chapter 15: 15.1-15.8 (r), 15.9 (o)
     - Chapter 16: 16.1-16.5 (r), 16.6-16.10 (o)
3. Prerequisites
   - Placement into MATH253X is by passing MATH252X with a grade of C- or better, or earning a 4 or 5 on the BC AP Calculus exam. Students who have not met the current placement requirements within the last two years will be dropped within the first two weeks of the course.
4. Types of assessments
   - Exams
     - at least two midterm exams during the semester
     - exams must be timed, proctored, closed book, closed notes, and no calculators
     - exams must be majority written answer (not multiple choice)
     - exams must be pencil-and-paper exams, written and graded by a faculty member
     - 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 of the Assessment Criteria listed on the next page
   - Other Assessed Work
     - instructors should provide written feedback to students approximately weekly throughout the semester. This can be through humanly-graded assignments or email correspondence
     - students must have a mechanism for estimating their current grade in the course
     - there must be human feedback prior to the first exam
5. Grading Policy
   - The syllabus must include a grading scale in some form.
   - Plus/minus grading is at the discretion of the instructor, but 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 40%
Comprehensive Final Exam	At least 20%

Assessment criteria

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

- Vectors and the geometry of space: most skills from this may appear within problems from the other criteria:
  - vectors (in the plane and in space) and operations on vectors ($\pm, \cdot, \times$); vector projection
  - equations of lines and planes
  - surfaces in space
- Parametrization of motion in the plane and in space.
  - integration of vector-valued functions
  - differentiation of vector-valued functions
- Differential calculus on functions of several variables.
  - basic understanding of functions of two variables (for example: domain, level curves, or limits)
  - partial derivatives; chain rules; possibly differentials
  - gradients and a couple of its direct applications (directional derivatives, tangent planes, linear approximation)
  - extrema of functions of two variables
- Integral calculus on functions of several variables. Some of the following may appear only in set up rather than full evaluation.
  - double and triple integrals in rectangular coordinates
  - iterated integrals in polar and/or cylindrical and/or spherical coordinates
- Vector calculus
  - basic knowledge of vector fields through sketching or properties (conservative, curl, divergence)
  - line integrals: scalar or of vector fields
  - fundamental theorem of line integrals
  - Green's theorem
- Applications: choose at least three among the following:
  - distance in space, area of parallelogram or volume of parallelepiped, work or torque
  - particle motion: graphing, arc length, components of acceleration, projectile motion
  - applications of integrals among area in the plane, volume, mass, moments, surface area
  - inverse square laws

Final exams will be evaluated by the Core Assessment Committee based on the described desired outcomes for the course. Six questions on the exam corresponding to the six bulleted items above will be chosen for closer review. The overall content of the exam and students' ability to write proper mathematics will also be assessed.