COURSE SYLLABUS

# MATH253A - ACCELERATED CALCULUS III

SPRING 2018

**Lecture time and place:** M/W/F 8:30 - 9:20pm, T 10:30-11:20, Keller 404

**Instructor:** Wolfgang Erb
**e-mail:** erb@math.hawaii.edu
**Web:** `http://www.math.hawaii.edu/~erb/Math253a`
**Office:** PSB 402
**Office hours:** M/F 10:30 - 11:30 am, W 1:30-2:30 pm.

**Course description:** Vector calculus, maxima and minima in several variables, multiple integrals, line integrals and Greens Theorem, surface integrals, Stokes Theorems.

**Course objectives:** This is an honors course. A successful Math 253A student will have an indepth, computational as well as conceptual, understanding of the topics listed above, be able to solve routine and challenging problems, and be able to apply the ideas creatively.

**Course format:** This four credit class meets for 200 minutes of lecture per week.

**Prerequisite:** Math 252A, AP Calculus BC score of 4 or 5 and consent; or a grade of A in Math 242 and consent.

**Program objectives:** This is the third and final course of the honors calculus sequence for STEM (Science, Technology, Engineering, Math- ematics) majors. As this is an honors course, the approach is not just computational, but there is also an emphasis on theory and proofs. Mathematics is the basic language for STEM fields. Understanding the language, the basic ideas and results, and the computational tech- niques of calculus is prerequisite to advanced learning in any STEM field.

**Textbook:** *University Calculus, Alternate Edition* by Hass, Weir and Thomas, Pearson-Addison Wesley. In this course, we will cover Chapters 11, 12, 13, 14 and 15.

**Grading:** Course grade will be determined in the following way:

Homework: 25%
Midterm I: 15%
Midterm II: 15%
Midterm III: 15%
Final exam: 30%

The letter grade will be determined according to the following scale:

87.5% will guarantee an A
75 % will guarantee a B
62.5 % will guarantee a C
50 % will guarantee a D.

Note: I'm usually not giving ±-scores. You should expect to get a letter grade based on the above schedule.

**Homework:** Problem sets will be assigned weekly on Friday. The processed homework will be collected one week later in class and then graded. A pdf of the assignment will be posted on the homepage of the course:

`http://math.hawaii.edu/~erb/Math253a/`

The two lowest homework grades will be dropped. No late work will be accepted.

**Midterm exams:** Two midterm exams will be given during the semester.

Midterm I: 02/16/2018
Midterm II: 03/16/2018
Midterm III: 04/13/2018

Attendance on exam days is compulsory. Otherwise, a grade of zero will be recorded. Any excused, documented conflict with a test date must be reported to the instructor prior to the date. No make-up exams will be offered. If you have an excused absence for an exam, your grade will be replaced by the final exam grade. The only exception will be for students requiring special accommodation due to disability.

**Final exam:** A comprehensive final exam will be held on Friday, May 11, from 7:30–9:30 am in Keller 404.
Check `http://manoa.hawaii.edu/undergrad/schedule/final-exams/fall/` for changes.

**In the exam:** You are allowed to have one 8.5" by 11" paper with handwritten notes in your exams. No further notes, books or electronic devices are allowed.

### Approximate Timeline

Weeks 1 - 2: Vectors and the geometry of space.
(1) Section 11.1: Three-dimensional coordinates.
(2) Section 11.2: Vectors.
(3) Section 11.3: The dot product.
(4) Section 11.4: The cross product.
(5) Section 11.5: Lines and planes in space.
(6) Section 11.6: Cylinders and quadric surfaces.

Weeks 3 - 4: Vector-valued functions in space.
(1) Section 12.1: Vector functions and derivatives.
(2) Section 12.2: Integrals of vector functions.
(3) Section 12.3: Arc length in space.
(4) Section 12.4: Curvature of a curve.
(5) Section 12.5: Tangential and normal components.
(6) Section 12.6: Velocity in polar coordinates.

Weeks 5 - 7: Partial derivatives.
(1) Section 13.1: Functions of several variables.
(2) Section 13.2: Limits and continuity in 2D and 3D.
(3) Section 13.3: Partial derivatives.
(4) Section 13.4: The chain rule.
(5) Section 13.5: Directional derivative and gradients.
(6) Section 13.6: Tangent planes and differentials.
(7) Section 13.7: Extreme values and saddle points.
(8) Section 13.8: Lagrange multipliers.
(9) Section 13.9: Taylors formula for two variables

Weeks 8 - 10: Multiple Integrals.
(1) Review Section 11.5 and Section 11.6
(2) Section 14.1: Double integrals (rectangles).
(3) Section 14.2: Double integrals (general).
(4) Section 14.3: Area by double integration.
(5) Section 14.4: Double integrals in polar form.
(6) Section 14.5: Triple integrals (rectangles).
(7) Section 14.6: Moments and centers of mass.
(8) Section 14.7: Triple integrals (cylinders, spheres).
(9) Section 14.8: Substitutions in multiple integrals.

Weeks 11 - 15: Integration in vector fields.
(1) Section 15.1: Line integrals.
(2) Section 15.2: Vector fields, work and flux.
(3) Section 15.3: Conservative vector fields.
(4) Section 15.4: Green's theorem in the plane.
(5) Section 15.5: Surfaces and area.
(6) Section 15.6: Surface integrals and flux.
(7) Section 15.7: Stokes' theorem.
(8) Section 15.8: Gauss' theorem.