Syllabus and schedule of topics for Math W53 (online summer version of Math 53)

Prerequisites: Math 1B or equivalent. Credit: 4 units. This course counts the same as the usual version of Math 53 to satisfy prerequisite or major requirements.

Timing: The duration of the course is 8 weeks. Estimated time commitment is 20 hours per week.

Course description: This course has the same content as the usual, face-to-face version of Math 53. The official description in the course catalog is as follows: Para- metric equations and polar coordinates. Vectors in 2- and 3-dimensional Euclidean spaces. Partial derivatives. Multiple integrals. Vector calculus. Theorems of Green, Gauss, and Stokes. The purpose of this course is to introduce the basic notions of multivariable calculus which are needed in mathematics, science, and engineering.

Textbook: Stewart, Calculus: Early Transcendentals, 7th edition. A custom edition containing only the chapters needed for this course will be made available at a reduced price. Supplementary notes will be provided online.

Course structure: The following are the basic components of the course:

• **Lectures and quizzes**. There will be a number of short video lecture segments each week. Each lecture segment will be followed by a simple multiple-choice quiz to test understanding of the material, with instant feedback and explanations of the answers. Completion (but not correctness) of these quizzes counts towards the participation component of the grade. While the lectures can be viewed at any time, each lecture and quiz must be completed before a fixed deadline to receive full credit.

• **Homework**. Since extensive practice is essential for mastering

this material, there will be two homework assignments each week. These will be given a pass/fail grade based on completeness. Discussion of homework with fellow students is permitted, as long as each student writes their own solutions independently. It is not appropriate to post answers to homework problems on the discussion forums before an assignment is due.

- **Quizzes.** There will be a quiz each week. Quizzes are similar to homework but will have a (generous) time limit and will be graded by the GSI's, who will provide detailed personalized feedback.

- **Discussion forums**. Here students can ask each other questions and exchange thoughts on the course at any time. Students will be divided into groups, each of which will have their own discussion forum and their own GSI. The GSI and the professor will periodically check in and help answer questions.

- **Office hours**. The GSI's and the professor will hold live online office hours at various times throughout the week. Any student can participate in any session. However if no one shows up for an office hour in the first ten minutes, then that office hour will be cancelled.

- **Email.** For questions that cannot be answered in office hours or the discussion forums, students can contact their GSI or the professor by email.

- **Final exam**. Each student must show up in person for the final exam with an ID. Grading policy: The course grade will be determined as follows:

- **Homework and participation:** 30%. This is determined by the percentage of post-lecture quizzes and homework assignments that are completed on time. A small amount of

bonus points can be earned for helpful comments in the discussion forums.

- **Quizzes:** 20%. The lowest quiz score will be dropped.

- **Final exam**: 50%. A passing grade on the final exam is required to pass the course. Schedule of topics:

- Part 1: Preliminaries. (Weeks 1 and 2) Introduction to the course. Geometry of curves. (Stewart chapter 10.) Geometry of vectors, dot product, cross product. Planes and quadric surfaces. (Stewart chapter 12.) Vector-valued functions. (Stewart chapter 13.)

- Part 2: Differentiation. (Weeks 3 and 4) Limits and continuity, partial derivatives, chain rule, directional derivative and gradient, optimization, La- grange multipliers. (Stewart chapter 14.)

• Part 3: Integration. (Week 5 and most of week 6) Double and triple integrals in Cartesian, polar, cylindrical, and spherical coordinates, change of variables. (Stewart chapter 15.)

• Part 4: Vector calculus. (End of week 6, week 7, and most of week 8) Line integrals and surface integrals, fundamental theorem for line integrals, Green's theorem, Stokes's theorem, divergence theorem. (Stewart chapter 16)

• Part 5: Review. (End of week 8)