South China Normal University International Summer Session

22G45581: Multivariable Calculus (Calc III)

Term: July 15th –August 9th, 2019
Instructor: Dr. Matthew Macauley
Home Institution: Clemson University
Credit: 4

Course Description
This will be a standard Vector (or Multivariable) Calculus class being offered in an intensive 4-week summer session, so everything goes quickly. In terms of content, workload, and difficulty, it will be roughly equivalent to a 15-week 4-credit hour Vector Calculus class at a tier-1 American university.

Course Readings
This course will be very "textbook independent", as homework problems will not be taken from any textbook. However, I am officially making the required book Calculus, by Gil Strang at MIT. Wellesley-Cambridge Press, ISBN 978-0-9614088-2-4 (1991).
https://ocw.mit.edu/resources/res-18-001-calculus-online-textbook-spring-2005/textbook/
Calculator: A calculator is not required for this course and will not be allowed on quizzes or exams. You are free to use one for the homework, though.

Grading Scale

Percentage	Grade
90-100	A
80-89	B
70-79	C
60-69	D
$<$60	F

Grading
The grades are based on individual homework, one midterm, and the final exam. There are four weekly individual homework assignments, which will be assigned near the beginning of week 1 to 4 and due on Monday of the following week. Get started early because they are long, as this is an entire semester course condensed into 4 weeks.
No late homework will be accepted. You are encouraged to discuss the homework and to work together on the problems. However, each student is responsible for the final

preparation of his or her own homework, in his or her own words. Homework must be neatly well-written with work shown and proper exposition for full credit. The exam will consist of short answer questions derived from the lecture material. The final exam will be cumulative.

The weights of grading components are as follows:

Homework 25%
Midterm 25%
Final exam 50%
TOTAL 100%

Any student who gets an A or B on the final exam (including + and -) will get at least that grade in the course, provided that they have a passing grade on the homework.

Course Schedules
This course will cover Chapters 11-15 in Strang's book. The specific daily schedule is below.

Week 1:
• Monday: Geometry of R^n. The dot product and cross product.
• Tuesday: Matrices and determinants. Equations of lines and planes.
• Wednesday: Parametric equations. Calculus of parametric equation
• Thursday: Kepler's 2nd law of motion. Partial derivatives.
• Friday: Critical points of multivariate functions. The second derivative test.

Week 2:
• Monday: The chain rule. The gradient and directional derivatives.
• Tuesday: Solving constrained optimization problems with Lagrange multipliers.
• Wednesday: Non-independent variables. Double integrals.
• Thurs day: Double integrals in polar coordinates. Average values. Weighted averages.
• Friday: MIDTERM

Week 3:
• Monday: Density, mass, and moments of inertia.
• Tuesday: Change of variables and the Jacobian matrix.
• Wednesday: Triple integrals. 2D vector fields and line integrals.
• Thursday: Conservative vector fields and path independence.
• Friday: Gradient fields, potential functions, and curl in two dimensions.

Week 4:
• Monday: Green's theorem for work. Flux, divergence, and Green's theorem for flux.
• Tuesday: Simply connected regions. Spherical coordinates. 3D vector fields.
• Wednesday: Surface integrals and flux. The divergence theorem. Line integrals in R^3.
• Thursday: The curl of a 3D vector field. Stokes theorem.
• Friday: FINAL EXAM.