MA5371 – MULTIVARIABLE CALCULUS
JUL – NOV 2016

Jaikrishnan Janardhanan   Indian Institute of Technology Madras
jaikrishnan@iitm.ac.in   https://bit.ly/MA5371

THIS IS THE LAST HANDOUT YOU WILL RECEIVE IN HARD-COPY!
Please check the course website periodically for announcements, assignments and other handouts related to this course. You can access the course website from the link at the top of this page.

About the course. The objective of this course is to develop the theory of Calculus in several variables. The course will culminate with complete proofs of the classical theorems of Stokes, Green and Gauss. However, our approach to proving these theorem will be emphatically *non-classical*. We shall prove a general version of Stokes theorem for manifolds from which the classical theorem can be derived in a few lines. The theory of manifolds (i.e., Differential Topology) is one of the crowning achievements of modern mathematics with contributions from the likes of Poincare, Weyl, Whitney, Milnor, Thom and other great mathematicians of the last century. Manifolds now arise everywhere from robotics to string theory and are one of the central objects of study in mathematics. This course is targeted at first-year postgraduate students who have had no prior exposure to the subject. I will spend a considerable amount of time on the fundamentals of the theory and will strive to make the course as self-contained as possible. However, I expect the students to have a thorough grounding in Real Analysis in one variable as well as Linear Algebra.

The primary emphasis of the course will be on **geometric intuition** and **problem solving**. Trying to understand Mathematics by simply sitting for a lecture or reading from a book is like trying to learn how to drive a car by watching a F1 race! I plan to spend at least a few lectures on problem solving. I will also periodically post assignments on the course website.

References. Your primary reference material will be the notes you take in class. I shall closely follow the following textbook:

Multivariable Mathematics: Linear Algebra, Multivariable Calculus, and Manifolds by Theodore Shifrin, Wiley.

I recommended that you photocopy Chapters 3, 5, 6, 7 and 8 which will be the course syllabus. Video lectures given by Prof. Shifrin can be accessed on https://bit.ly/shifrin.

Assignments and Class Tests. You will be required to solve assignments as part of your grading. You are expected to solve *every single problem* and write up the solutions. However, as it is impossible for me to grade every single assignment, you will be evaluated based on surprise class tests. Each such test will consist of one question from the latest assignment. The purpose of these tests is to ensure that students are regular in solving the assignments. You will be given only 15 minutes to write up the solution. If you have been diligently solving the assignments and writing up the solutions, you should have no problem finishing the test in 5-10 minutes!

Office Hours. I shall make it a point to be make myself available on Tuesdays and Thursdays from 1:30 – 4:30 PM in my office (HSB 245A). Please feel free to drop into my office during this time if you have any questions about the course material.

Evaluation. You will be evaluated based on your performance in the class tests, two quizzes and the final exam. The exact weightage will be decided later. All the best and enjoy the course!