Teaching Statement – Gabriel Nagy

Experience

My first teaching experience was as Teaching Assistant in the period of 1991-1995, while I was a graduate student at the Physics Department in the University of Córdoba, Argentina. During that period I taught undergraduate physics courses, two semesters per year. During my stay at the University of California at San Diego (UCSD), I have been a teaching visitor in the period Fall 2003-Summer 2004, and in Fall 2005-Summer 2006. I have also taught as Assistant Project Scientist at UCSD in the period Summer 2007-Fall 2007, and I have scheduled to continue teaching until the Spring 2008. I taught the calculus courses 10A,B,C, the calculus for science and engineering 20A,C, and the Linear Algebra course 20F. I will teach the Differential Equations course, 20D in the Spring 2008. I had several classes with more than a hundred students, and a few classes with close to three-hundred students. Large classes can be complex to coordinate, and even the smallest mistake can have unexpected aftermaths. One learns to be very careful with details that are trivially overlooked in a small class.

A complete summary of the classes I have taught at UCSD can be found on my personal webpage[1]. The official teaching evaluations at UCSD can be found on the CAPE website at UCSD[2]. It may also be useful to visit the unofficial online teaching evaluations websites[3].

Teaching style

I am used to give daily lectures, frequent homework assignments, homework-based quizzes, and two or three exams per semester. I try to follow a main reference book in the subject when this is possible, and to mention complementary references. If there is no main reference to follow, then I prepare typed notes, so the students have a main set of notes to follow.

Lectures: I have approached mathematics from theoretical physics, so I usually provide, when possible, physical examples as motivation for the mathematical concepts under study. I usually try to explain a central concept by selecting a particular example that illustrates the main ideas of the subject under study. Then, the precise theory can be presented, and the example is always there to go back and highlight different aspects of the main theory. Relations with other fields and historical remarks are always useful. Throughout the lecture I encourage the students to both ask questions about the material, as well as to express their own ideas for a next step in a mathematical proof.

Handouts: I provide handouts when the main textbook does not cover a topic I want to discuss, or when it does in a style and/or order different from what I would prefer.

Homeworks: The only way to learn mathematics is by doing mathematics. Homework assignments are a fundamental part of a mathematics course. They have to be carefully planned, to review the concepts mentioned in class, to work out specific examples of these concepts, and to include situations that can not be discussed in class.

Exams: In order to prepare an exam I try to identify the basic concepts the student must master from the class. I then select questions from variations of homework assignments where these concepts are clearly used. A ten question exam should have at least one problem easy enough for almost everybody to complete it. The exam should also contain a difficult problem which requires an extrapolation of the main ideas of the class in order to solve it, aimed to single out the best students. The eight remaining questions should be centered on the basic ideas the students must have mastered from the class.

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[1] `http://www.math.ucsd.edu/~gnagy/teaching/index.html`.

[2] `www.cape.ucsd.edu/` and then search by name.

[3] `www.ratemyprofessors.com/ShowRatings.jsp?tid=299179`.

Technology: Projected slides may be useful in research talks, but are often not an effective replacement for chalks and blackboard in a mathematics class. The pace of writing on a blackboard is similar to the pace that students assimilate new ideas. Writing on the blackboard makes the class more honest; it is easier to skip difficult steps in planned slides. Nevertheless, I have found useful to have a projected slide somewhere in the classroom as a summary of the main concept one is developing, while working on the blackboard. I am still trying to find and optimal way to blend new and old technologies in a classroom.

Teaching goals

I am interested in teaching undergraduate courses, including the differential and integral calculus, vector calculus, linear algebra, and introduction to differential equations.

Regarding graduate courses, I am specially interested in a course focusing on advanced mathematical aspects of the classical theory of General Relativity. Such a course could be a continuation of the Geometrical Physics courses (259A,B,C at UCSD), where fundamental topics are covered, such as manifolds, tensor fields, Einstein's equations, homogeneous and isotropic cosmologies, and the Schwarzschild solution. The advanced course would include the Hawking-Penrose singularity theorems, the initial value formulation for Einstein's equations, the definition of asymptotic flatness, the theorems on the positivity of mass, the definition of a black hole, the cosmic censorship conjecture, and the thermodynamics of black holes.

I am also interested in the standard courses Geometrical Physics (259A,B,C); Mathematical Methods in Physics and Engineering (210B,C); and Partial Differential Equations (231A,B,C). In the latter I would like to introduce well-posedness results for the initial value problem for hyperbolic equations with constraints, such as the Maxwell equations and the Einstein equations.