Report on the course: Differential Geometry
Phnom Penh University, December 2007

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Organization

The course was given along 3 weeks with 5 lectures each week, each one of 3:30 hours, including a 20 mn break and two short tests of 1:30 each plus one 2 hours final exam.

The audience was regular, between 25 and 30 students, including Yim Vichea, an Assistant Professor who made comments for the students all along my courses.

I was taken from my home to the university and back by Kim Chamroeun Vuthy a good and efficient student. I must say that the organisation of my courses was excellent.

My feelings

The students looked very much interested and asked many questions. Some of them wrote to me after the course to tell me that they learned news topics (that was the aim of the course!) that interested them very much.

However, it seems that they are not use to make abstract reasonnings. They had many difficulties with general topology, more that with differential calculus. To my opinion, the main difficulty come from the fact that they don't have good basis in logic and Set theory. In particular, they are not use to make operations with sets (union, intersection, direct and inverse images, etc.).

When correcting the exam I made a strong difference between those who seem to understand what is a proof and a reasonning, even if they don't solve the question, and those who write nonsense without any meaning. Of course, I understand that it is striclty impossible to assimilate all the program below in 3 weeks, and the exam was more or less a repetition of the two previous tests, concentrated on metric spaces for topology and search of extrema for differential calculus. On 27 students who attend the final exam, 12 have 10/20 or more.

Program

The following topics have been treated (sometimes, very superficially):

1 Review on general topology (6 lectures):
topological spaces, metric spaces, compact spaces, connected spaces, Banach spaces.

2 Differential calculus (5 lectures)
Differential of a map, definition, composition, partial derivatives and Jacobian matrix.
Necessary conditions for local extremum (with many applications).
The mean value theorem.
Higher differentials, Taylor formula, Hessian, sufficient conditions for local extremum.

3 Differential geometry (3 lectures)
The local inversion theorem, embedded submanifolds (immersions and submersions), tangent space.

There were hand-written Notes in French available, and I hope to provide soon an English LateX version.

Contacts

I met Prof. Pheakdey the first day and later Prof.Chan Roath with whom we discuss of the future of our cooperation.