

## Appendix A

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Interview of JH spring 2009 about DN2275 by Raul Tempone, colleague at NA department KTH/CSC.

Q1) How did you plan the course contents in terms of the goals you wanted the students to achieve by the end of it? (You said you did it backwards, like in a dynamic programming fashion, could you be a bit more specific?)

My goal is to give the students the possibility to reflect on some contemporary research challenges in CFD that I think is of major importance: (1) existence & uniqueness of Navier-Stokes (NS) and turbulence computations, (2) boundary conditions modeling turbulent boundary layers, and (3) generation of aerodynamic forces (lift and drag) in turbulent flow (and flow computations).

To be in a position to talk and think about (1)-(3) you typically need to be an expert in (i) mathematical analysis, (ii) numerical analysis and (iii) fluid mechanics. I have designed this course with the goal of learning sufficiently of (i)-(iii) to be able to understand the basic problems of (1)-(3), at least in some qualitative way.

The first three lectures with problems 1-10 then represents what I consider a minimum of (i)-(ii), the second part of the course is a computer project using a G2 solver in FEniCS to play with the questions (1)-(3), and finally the last 3 seminars are devoted to discussing the questions (1)-(3) in the group where the students should prepare for the lectures by reading research papers (and write short reviews).

Q2) which mental models are students likely to bring with them that you want them to challenge? How do you plan to accomplish this?

It may depend on their background, but I think they believe (1) is a purely mathematical question (the Clay Prize), separate from CFD where it is all a question of sufficient computational resolution. I think they believe (2) and (3) to be well understood in fluid mechanics (following Prandtl's ideas).

I want them to first work with the theory of problems 1-10 and play with the computer projects, to gain some confidence in what they see, before addressing the problems (1)-(3), where they then will hopefully find that what they have experienced in the course is in opposition with what they

read in (some) research papers. In addition, when reading papers they will find that there are several conflicting views of (1)-(3) in the literature.

Q3) how do you plan to help the students to learn and at the same time develop a critical assessment of their knowledge? How do you plan to guide them to read more effectively, getting to the central issues and being analytic about them?

A critical assessment will hopefully develop since: (a) what they learn may (will) conflict with what they have been learned earlier in other courses, (b) it will conflict with some research papers we study in the course.

To read effectively, I want them to have a goal with their reading. For example, to solve the problems 1-10, or to answer some question related to (1)-(3).

Q4) I very much liked the active format of your class. How did you come up with it? Is there anything else you have in mind to keep the students activated?

Good to hear that you like it. I am influenced by the pedagogics course I took in 2007 (LU1), where it is emphasized that the most important is what the student does not what you do. Some things that I think is important: small groups (to arrange the tables in small groups actually seems to do a main difference) to encourage collaboration so that you do not get stuck, and it is harder to "hide" and be passive, a clear focus (like 3 problems), not the same for 2 hours but instead break into different activities (me talking, groups working, full class discussion/presentation etc.). Also, some "internal pressure" from group mates and the rest of the class, and some pressure that you may have to present something for the class. I think a good idea would have been to encourage/force some rotation in the groups as well.

Q5) do you have any particular trick to get the students attention?

I try to connect what we do in class to the big picture, that we are not just solving problems (sudoku...). Also there are many small examinations (papers) frequently in the course to avoid students to relax until the last week before an exam.