Turbulence, SG2218, HT-2019
Course-pm and preliminary program

Course literature: Turbulent flows, Stephen B. Pope, Cambridge University Press. Each student should read the book. Twenty copies have been ordered to the "kårbokhandeln". The book can also be rented as an e-book at for example Amazon. On top of the book, I will provide you with my lecture notes through Canvas. Stefan Wallin and Ramis Örlü who will give the two last lectures on advanced turbulence modelling (Stefan) and experimental methods (Ramis) will also provide you with their lecture notes. However, the lecture notes will not be sufficient. **Reading the book is mandatory.** I therefore recommend you to buy the book as soon as possible and start reading it!

Lab: will be carried out on a wake flow in weak 46. Each group will make a series of measurements in the turbulent wake of a cylinder, at a specific downstream distance from the wake and a specific mean velocity. These two parameters will be different for all groups. All the data will then become available for all groups. All students will analyse all the data and write a labb-report that will be handed in individually. Each lab-group will consist of 3-4 students. You sign up to a group through Canvas. There will be a lap-pm available at Canvas. I hope that I will be able to fix so that the graduate students can access Canvas. In case of problems I will personally help you to sign up for the lab and to access all material that you need.

Lectures: I will give 12 two-hours lectures following Part 1 in Pope, and 4 lectures following selected parts on Part 2 in Pope. Stefan Wallin will give a two-hour lecture on advanced turbulence modelling and Ramis Örlü will give a two-hour lecture on experimental methods.

Hand-in assignments: I will give you four hand-in assignments. The assignments will be available at Canvas latest Friday, week 45, 46, 47 and 48, and should be handed in through uploading on Canvas, as a single pdf-file, latest one week later, Friday, week 46, 47, 48 and 49.

Lab-report: should be handed in, as a single pdf-file on Canvas, latest Friday, week 50. Instruction on how the report should be written will become available at Canvas, latest Friday, week 48.

Examination consists of three parts, hand-in assignments, labb-report and oral exam which is individual and will be carried out week 51 Monday-Friday, or week 3, January 2020, Monday to Friday. The hand-in assignments and the labb-report **must** be available to me before the oral exam!

Grading: will mainly be based on the oral exam. However, you can get bonus points for meeting the deadlines of the assignments and the lab-report and also

for performing well on these parts. For each assignment you can get two bonus points, one for handing it in time, and the other for good performance. For the labb-report, you can get four bonus-points, two for handing it in time, and two for good performance. Totally, you can thus get 12 bonus points. If you have 9-12 bonus points you will automatically get a grade which is one level higher than I otherwise would have given you. For example, if I grade the oral exam as a B, you will, in this case, get the final grade A. If you have 5-8 bonus points, and you are somewhere in between two grades based on the oral exam, then you will get the higher grade. For example, if I think that you have almost deserved the grade A based on the oral exam, you will get an A. If you have less than 5 bonus points, it will not affect your grade. Immediately after the oral exam I will let you know if you have passed or failed. Shortly after the exam I will inform you about the grade through an e-mail, including a short written motivation.

Week 44

Sign up for the lab as soon as possible!

Lecture 1: The equations of fluid motion (Pope: Section 2, Part 1)

Lecture 2-3: The statistical description of turbulent flows (Section 3)

Week 45

Lecture 4: Mean flow equations (Section 4)

Lecture 5: Free shear flows (Section 5)

Assignment 1 announced on Canvas latest Friday 8/11.

Week 46

Lab!

Lecture 6: Free shear flows (Section 5)

Lecture 7-8: The scales of turbulent motion (Section 6)

Assignment 1 should be handed in latest Friday 15/11.

Assignment 2 announced on Canvas, latest Friday 15/11.

Week 47

Lecture 9: The scales of turbulent motions (Section 6)

Lecture 10-11: Wall flows (Section 7)

Assignment 2 should be handed in latest Friday 22/11.

Assignment 3 announced on Canvas, latest Friday 22/11.

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Week 48

Lecture 12: Wall flows (Section 7)

Lecture 13: Direct numerical simulations (Section 9, Part 2)

Assignment 3 should be handed in latest Friday 29/11.

Assignment 4 and lab-report instructions announced on Canvas, latest Friday 29/11.

Week 49

Lecture 14. Large eddy simulations (parts of Section 13)

Lecture 15-16 Turbulent viscosity models (Section 10)

Assignment 4 should be handed in latest Friday 6/12

Week 50

Lecture 17: Stefan Wallin. Advanced turbulence modelling

Lecture 18: Ramis Örlü: An overview of experimental methods
Course evaluation form handed out, filled in and handed in anonymously.
Everybody should attend!

Lab-report should be handed in latest Friday 14/12.

Week 51

Oral exam. Sign up!

Week 3, January 2020

Oral exam. Sign up!

Graduate students:

should make an extra assignment. You should write a short summary of one or two scientific articles. Discuss with me and your supervisor what a suitable article would be!