

# ES30D

## FUNDAMENTAL FLUID MECHANICS II

Dr Yongmann M. Chung

<http://www.eng.warwick.ac.uk/staff/ymc/ES440.html>

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# Introduction

# Preliminaries

- Dr Yongmann M. Chung

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- Website: [www.eng.warwick.ac.uk/staff/ymc/ES30D.html](http://www.eng.warwick.ac.uk/staff/ymc/ES30D.html)

- Office Hours

- Thursday 17:00-18:00,

- Friday 17:00-18:00.

# Lecture Programme

Timetabled sessions in Term 2 are

- Monday (15:05:00-15:55, Room L5),
- Tuesday (14:05-14:55, Room PLT),
- Friday (12:05-12:55, Room L4).
  - Set Exercises, Case Studies & Revision.

# Assessment

- 100% Examination
  - Three-hour written examination.
  - Three questions each for **ES30A** and **ES30D**.
  - **Two** questions out of **Three** will be required.
  - The questions will be based either on the lecture notes, the set exercises or the case studies.

# Examination

There will be one each of three broad types of question.

- A derivation.
  - Starting with the Two- (or Three-) dimensional **Navier-Stokes** equations.
- A design calculation.
  - Using given formulae.
- A descriptive question.

# ES30D : Study Schedule

- Introduction & Revision.
- Chap. 8 - Flow at very low Reynolds number. (Stokes flow)
- Chap. 9 - Lubrication theory.
  - Reynolds lubrication equations.
  - Lubrication of gears and bearings. (Hydrostatic)
- Chap. 10 - Flow at high Reynolds number.
  - Boundary-layer theory and its applications.
  - Turbulent flow & Vortices and vorticity.
- Chap. 11 - Computational fluid dynamics (**ES440**).
  - ODE/PDE & FDM/FVM/FEM/Spectral
  - Commercial CFD codes: **STAR-CD**
- Chap. 12 - Flow control.

# Prerequisites for ES30D

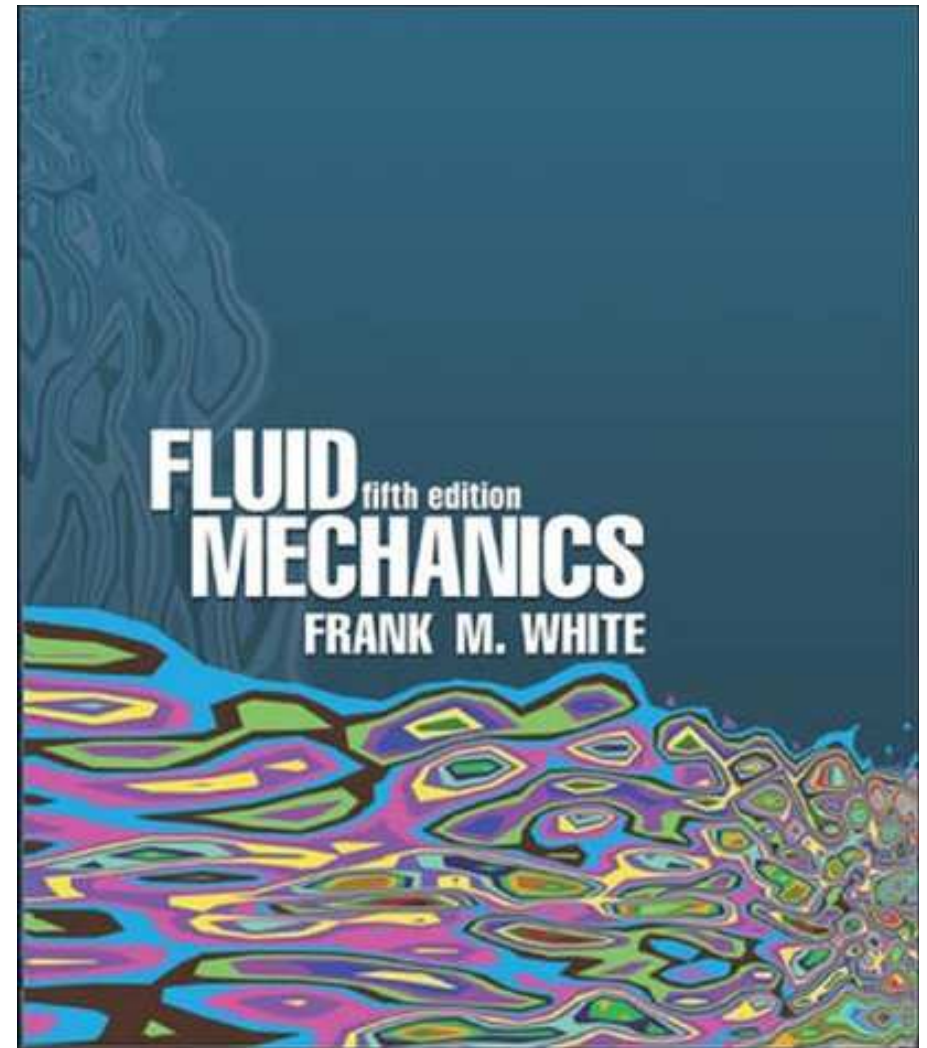
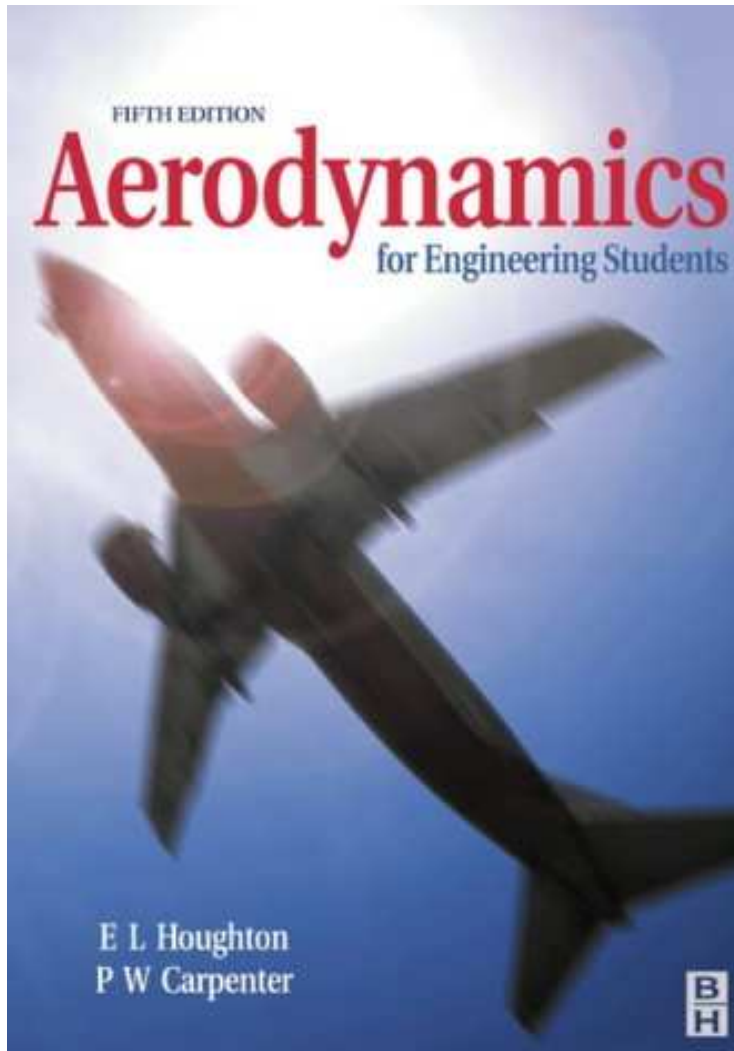
- Modules required:

- ES252 Fluid Mechanics or equivalent
- ES30A Fundamental Fluid Mechanics I

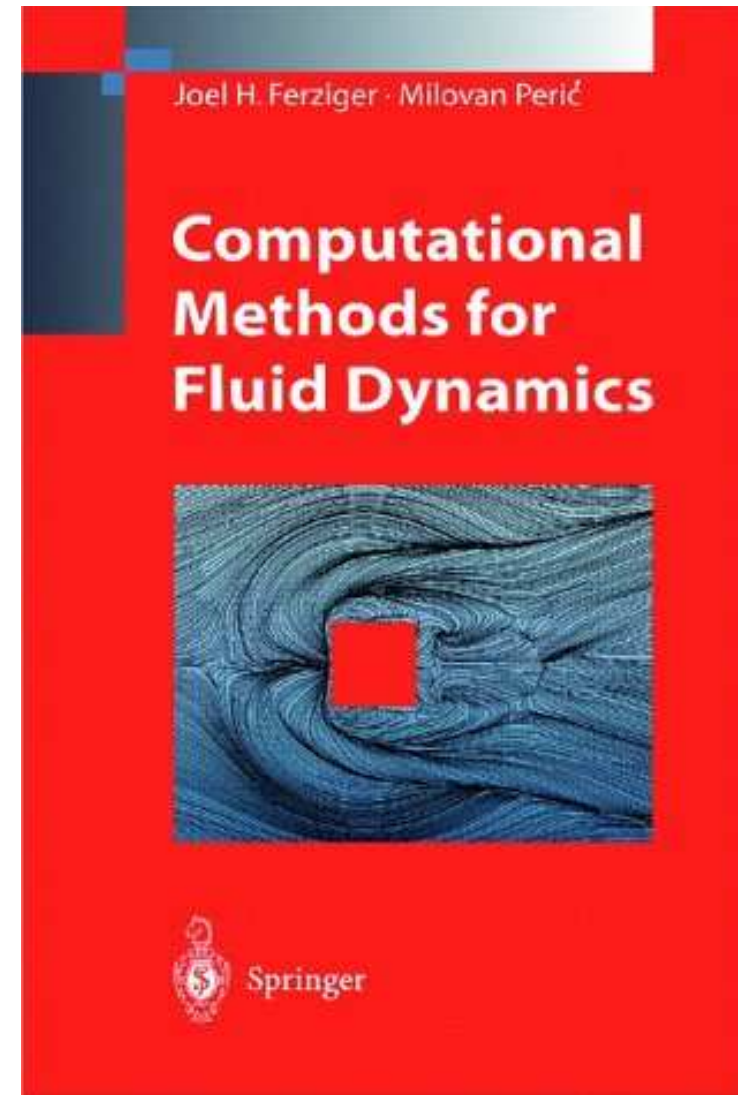
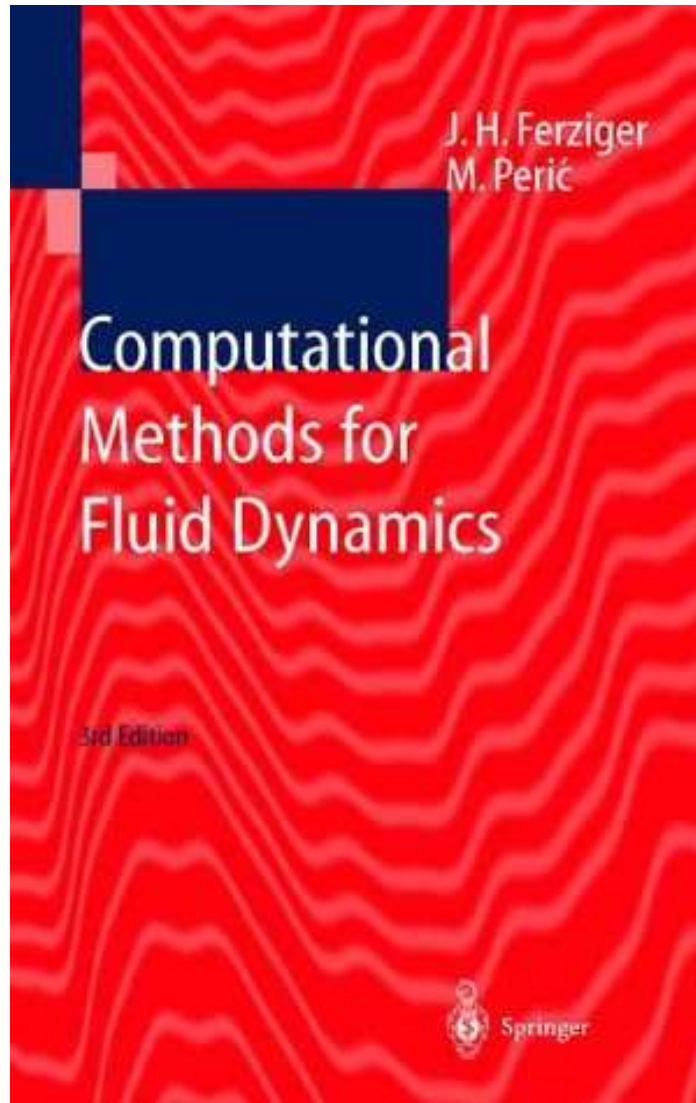
- Other Modules:

- ES164 Energy & Fluids
- ES157 Mathematics for Engineers

# ES30D Fluid Mechanics II



# ES30D Fluid Mechanics II - CFD:ES440



# ES30D BOOKLIST 2004/05

- Houghton, E. L. & Carpenter, P. W. 2003 *Aerodynamics for Engineering Students*. 5th Edition, Oxford: Elsevier Science.
- White, F. M. 2003 *Fluid Mechanics*. 5th Edition, McGraw-Hill.
- White, F. M. 1991 *Viscous Fluid Flow*. 2nd Edition, McGraw-Hill.
- Fox, R. W., McDonald, A. T. & Pritchard, P. J. 2003 *Introduction to Fluid Mechanics*. 6th Edition, John Wiley & Sons, Inc.
- Schlichting, H. & Gersten, K. 2000 *Boundary Layer Theory*. 8th Edition, Springer-Verlag.

# ES30D BOOKLIST 2004/05 - CFD

- Ferziger, J. H. & Perić, M. 2002 *Computational Methods for Fluid Dynamics*. 3rd Edition, Springer-Verlag.
- Ferziger, J. H. 1998 *Numerical Methods for Engineering Application*. Second edition, Wiley & Sons, Inc.
- Moin, P. 2001 *Fundamentals of Engineering Numerical Analysis*. Cambridge University Press.
- Fletcher, C. A. J. 1991 *Computational Techniques for Fluid Dynamics 1 & 2*. 2nd Edition, Springer-Verlag.
- Tannehill, J. C. Anderson, D. A. & Pletcher, R. H. 1997 *Computational Fluid Mechanics and Heat Transfer*. 2nd Edition, Taylor & Francis.