

# UNIVERSITY OF WARWICK

## School of Engineering

### Revision Notes

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You will be asked to answer 3 questions out of 5. There will 3 broad types of question:

- A derivation
- A 'design calculation
- A descriptive question

The questions will be based on the lectures: Most things could be found in Ferziger and Peric's textbook. Lecture notes could also be useful. It would be a good idea to be familiar with the data-book. Check my door and web-site for my Office Hours next term.

- **Chapter 1 Basic Concepts of Fluid Flow**

- Know the 1st, 2nd and 3rd Year Fluid Mechanics topics revised here.
- Dimensionless form of equations.
- Mathematical classification of flows.
- Mathematical classification of partial differential equations (PDEs).
- Elliptic, parabolic, and hyperbolic types.

- **Chapter 2 Introduction to Numerical Methods**

Mainly descriptive knowledge.

- Know what CFD is.
- The advantages and limitations of CFD.
- Accuracy & Errors of numerical methods.

- **Chapter 3 FDM**

- Know what FDM is.
- Derivation of first- and second-order finite difference schemes (Eqns. 3.7, 3.8, 3.9) using Taylor's series (Eqn. 3.3).
- Know what discretisation error is, including modified wavenumber (Parts 1 and 2 of Assignment 2).

- **Chapter 4 FVM**

- Know what FVM is.
- The advantages and disadvantages: FDM vs. FVM.

- **Chapter 5 Linear Equation System**

- Mainly descriptive knowledge but some simple theoretical treatment would enhance discussion of many topics.
- Derivation of finite difference equation (FDE) from partial differential equation (PDE).
- Solution algorithm of 1D and 2D problems.

- **Chapter 6 Unsteady Problems**

Know about or how to do the following:

- Explicit, implicit, semi-implicit method.
- Crank-Nicolson method.
- Steady vs. unsteady problems.

- **Chapter 7 The Navier-Stokes Equations**

Know about or how to do the following:

- Fractional step method.

- **Chapter 8 Complex Geometries**

- Coordinate transformation.
- Non-uniform grid.

- **Chapter 9 Turbulent Flows**

- Mainly descriptive knowledge but some simple theoretical treatment would enhance discussion of many topics.
- Know what DNS, LES, and RANS are.

**Good Luck!**