### Week 7:

- Review material covered in CM2110/CM2120
- Reading assignment for CM3110 (this class)
- Advanced material (optional)

#### PART IV ADVANCED FLOW CALCULATIONS

**Week 9**

- Macroscopic Balance Equations 741
  - 9.1 Deriving the macroscopic balance equations 741
    - 9.1.1 Macroscopic mass-balance equation 742
    - 9.1.2 Macroscopic momentum-balance equation 745
    - 9.1.3 Energy balance 750
    - 9.1.3.1 Closed systems 751
    - 9.1.3.2 Open systems 753
    - 9.1.3.3 Mechanical energy balance 759
  - 9.2 Using the macroscopic balance equations 766
    - 9.2.1 Pressure-measurement devices 769
    - 9.2.2 Flow-rate-measurement devices 772
  - 9.2.3 Valves and fittings 779
    - 9.2.4 Pumps 800
    - 9.2.4.1 Pump sizing 801
    - 9.2.4.2 Net positive suction head 814
    - 9.2.5 Open-channel flow 823
  - 9.3 Problems 830

**Week 10**

- How Fluids Behave (Redux) 838
  - 10.1 Viscosity, drag, and boundary layers 838
  - 10.2 Numerical solution methods 840
    - 10.2.1 Strategy 840
    - 10.2.2 Software packages 842
    - 10.2.3 Accuracy 843
  - 10.3 Laminar flow, turbulent flow 845
    - 10.3.1 Statistical modeling of turbulence 846
    - 10.3.2 Flow instability 851
    - 10.4 Lift, circulation 853
    - 10.5 Flows with curved streamlines 861
  - 10.6 Compressible flow and supersonic flow 867
    - 10.7 Summary
    - 10.8 Problems