AER 1318H: Introduction and Course Outline 2018

Professor D.W. Zingg
(416-667-7709, dwz@oddjob.utias.utoronto.ca, http://goldfinger.utias.utoronto.ca/dwz)

Textbook

Schedule and Mark Breakdown
1. Jan. 17 Lecture
2. Jan. 24 Lecture
3. Jan. 31 Lecture Assignment 1 due (worth 5%)
4. Feb. 28 Lecture Assignment 2 due (worth 35%)
5. March 7 Lecture
6. March 21 Lecture Assignment 3 due (worth 25%)
7. March 28 Lecture
8. April 4 Meeting Assignment 4 due (worth 15%)
9. April 18 Oral Examination (worth 20%)

Course Outline
1. An Implicit Finite-Difference Algorithm (ARC2D)
   1.1 Generalized curvilinear coordinate transformation
   1.2 Spatial differencing
   1.3 Implicit time marching and approximate factorization
   1.4 Convergence acceleration techniques
   1.5 Boundary conditions

2. An Explicit Finite-Volume Algorithm with Multigrid (FLOMG)
   2.1 Spatial discretization
   2.2 Multi-stage time-marching method
   2.3 Implicit residual smoothing
   2.4 Multigrid

3. Introduction to High-Resolution Upwind Schemes
   3.1 Godunov’s method
   3.2 Roe’s approximate Riemann solver
   3.3 General formulation of higher-order upwind schemes
   3.4 The definition of high-resolution schemes
   3.5 Second-order TVD semi-discrete schemes with limiters