# MECH 479: Computational Fluid Dynamics (3 credits)

**Lectures:**   Tues, Thurs 11:00–12:30; CEME 1212

**Instructor:**   **Prof. W. K. Bushe**
CEME 2069
Phone: 604-822-3398
e-mail: wkb@mech.ubc.ca

**Grading:**   Quizzes: 30%
Project: 20%
Final: 50%

## Course Synopsis

This course is an introduction to the computational methods used to predict temperature, pressure, velocity and fluid flow rates in an engineering context. It has been designed for advanced, mature students. The course will provide coverage of major topics such as numerical methods, gridding, stability, convergence and turbulence modelling; here the intent is to provide a background in these methods to enable students to make better use of commercial software packages through an improved understanding of the methods used in such packages. There will be a project in which students will be expected to use CFD to study a flow in a pseudo-industrial context.

# First class: Thursday September 10, 2015

# Course Outline by Lecture Period

| Date | Topic |
| --- | --- |
| **Date** | **Topic** |
| Sept. 10 | Introduction to CFD |
| Sept. 15 | "Review" of Differential Equations |
| Sept. 17 | Finite Difference/Volume/Element methods |
| Sept. 22 | Time integration/iteration |
| Sept. 24 | Boundary and initial conditions |
| Sept. 29 | Meshing, stability and convergence |
| Oct. 1 | Case study: simulating a laminar flow |
| Oct. 6 | **Quiz 1** |
| Oct. 8 | "Review" of statistics |
| Oct. 13 | Review of statistics (cont.) |
| Oct. 15 | Turbulence |
| Oct. 20 | Direct Numerical Simulation |
| Oct. 22 | Mean governing equations |
| Oct. 27 | Turbulent viscosity models |
| Oct. 29 | Reynolds stress models |
| Nov. 3 | Large Eddy Simulation |
| Nov. 5 | Validation |
| Nov. 10 | Case study: simulating a turbulent flow |
| Nov. 17 | Case study (cont.) |
| Nov. 19 | **Quiz 2** |
| Nov. 24 – Dec. 1 | Use of Commercial CFD |
| Dec. 3 | Review |