M.Sc. in Computational and Software Techniques in Engineering

Dr Karl Jenkins: MSc Course Director

options in:
Computer Aided Engineering (CAE)
Digital Signal & Image Processing (DSIP)
Software Engineering for Technical Computing (SETC)
Academics

Karl Jenkins  Peter Sherar
Len Freeman  Irene Moulitsas
Salvatore Filippone  Laszlo Konozsy
Panagiotis Tsoutsanis  Yifan Zhou
Course Content by Options

October – April

- Computational Methods
- C++ Programming
- Computer Graphics
- Management for Technology

May – August

- Individual Thesis Project

- Computer Aided Engineering (CAE)
- Digital Signal & Image Processing (DSIP)
- Software Engineering For Technical Computing (SETC)

- 50% taught modules
- 50% MSc thesis project
12 leading industrial members who’s role is to steer the MSc

Members from:

Airbus
Rolls Royce
Jaguar Land Rover
Fastest Aircraft Research Association Ltd
Cambridge Instrumentation
Daresbury Laboratories
Misys
Excelian
Rutherford Appleton Laboratory
Software Engineering for Technical Computing (SETC)

- Requirement Analysis & System Design
- High Performance Technical Computing
- Small Scaled Parallel Programming + GPGPU
- Cloud Computing
- Advanced Java
- Apps in Practical High End Computing
- Software Testing & Quality Assurance

http://www.cranfield.ac.uk
• Multi-threaded / stream computing applications
  • GPGPU implementations - Poisson, N-body, etc
  • Optimising computational algorithms for GPU/threaded applications
    • Search, sort, heuristics

• Distributed Computing
  • Cloud based applications (AppEngine, AWS)
  • MPI hybrid implementations

• Source Code Analysis & Testing
  • Test Automation & Fault Diagnosis
  • Source code visualisation
  • Code coverage analysis & Software testability
  • Stress testing applications in virtualised environment
Computer Aided Engineering (CAE)

- Geometric Modelling & Design
- Adv. Engineering Analysis
- CAE Applications & PLM
- Computational Eng. Fluids (CFD)
- CAE Advanced Applications
- Applications of Computational Engineering Design
- Advanced Graphics

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Advanced Graphics

MetaModelling

Astral Supercomputer

Computational Fluid Dynamics

CAE

Health Monitoring

Geometric Modelling
Digital Signal & Image Processing (DISP)
Digital Signal & Image Processing

Software Process

Information & Knowledge for real problems for industry
Master of Science in Computational Fluid Dynamics

Centre of Fluid Mechanics and Computational Sciences
School of Aerospace, Transport and Manufacturing
Cranfield University
Course Structure

MSc in CFD

Core Modules
11 modules
Covering Methods

Optional Modules
Choice of 5 out of 7 modules
Covering Applications

Research Project
~1000 Learning Hours
Core Modules

- Introduction to Fluid Mechanics & Heat Transfer
- Numerical Methods for PDE’s
- Numerical Modelling for Steady & Unsteady Incompressible Flows
- Numerical Modelling for Steady & Unsteady Compressible Flows
- Classical Turbulence Modelling
- Advanced Turbulence Modelling and Simulation: LES & DNS
- High Performance Computing
- Managing Uncertainty in Simulations: Validation & Verification
- Grid Generation / CAD
- Data Analysis, Data Fusion & Post Processing
- The Role of Experimental Data in CFD
Optional modules

- CFD for Aerospace Applications
- CFD for Micro and Nano-Flows
- CFD for Rotating Wings
- CFD for Automotive Flows
- CFD for Multiphase Flows and Combustion
- CFD for Environmental Flows
- CFD for Fluid-Structure Interaction
Thesis title: Aerodynamic performance prediction using a sweeping method: improving the efficiency of RANS near stall

**Aims:** Analyse the performance of computational cost and accuracy of incremental approach compared to a traditional single AoA simulation

**Outcomes:** Computational cost of new method is four times less than the single AoA scenario for the same number of polar points.
Our graduates

2011-2012 MSc course
Data from higher education statistics agency submitted June 2013 (45 people)

- 63% full time employment
- 8% part time
- 8% self employed
- 21% full time study