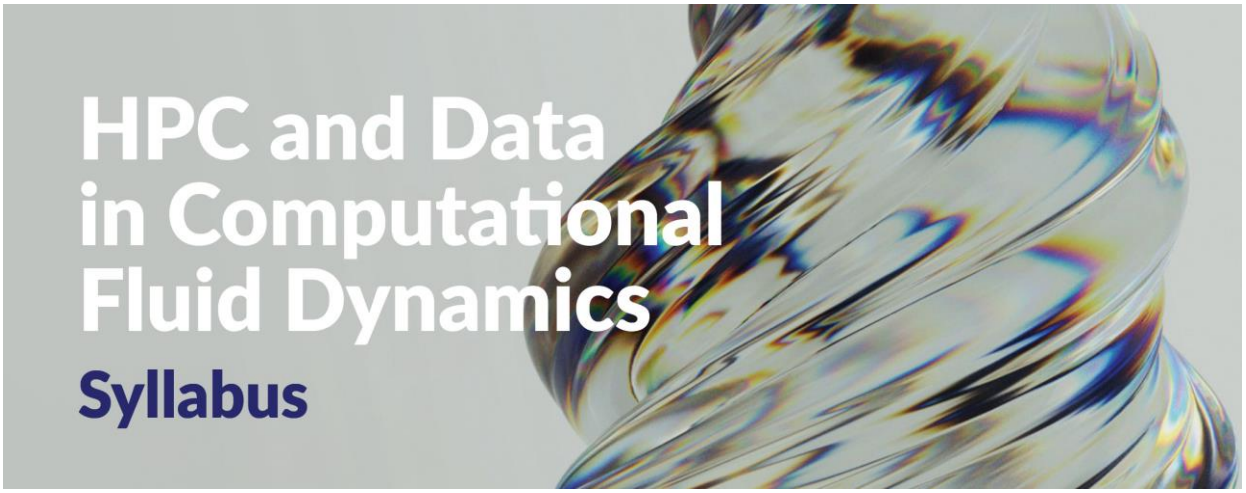


Week	Lecture	Topic	Lecturer
W1	**Introduction**		
29 Aug Tuesday 1-2:10pm AEST	Lecture 1	**Introduction** • Purpose of course • Brief introduction to CFD • The role of HPC in CFD • Overview of speakers and topics that will be covered	Prof Richard Sandberg (UniMelb)
31 Aug Thursday 1-2:15pm AEST	Lecture 2	**National and International HPC Landscape** ❖ National and International HPC Landscape • Australia's capabilities in HPCD research • How we are positioned in the larger international environment ❖ Introduction to Gadi and Setonix Introduction to HPC for CFD • Hardware components and important aspects • Software stack • Metrics for parallel performance	*Overview* - Prof Sean Smith (NCI) - 30 min *Gadi* – 15 min Dr Matthew Downton (NCI) *Setonix* - 15 min Dr Alexis Espinosa Gayosso (Pawsey) *Panel Discussion* – 10 min

W2	Mathematical Models and Discretization Basics I		
5 Sep Tuesday 5-6:10pm AEST / 8-9:10am BST	Lecture 3	**Governing Equations** • The Navier Stokes equations • Simplifications (Euler, Stokes, Boussinesq etc.) • Implications for modeling and simulation	A/Prof Fatemeh Salehi (Macquarie Uni)
7 Sep Thursday 1-2:10pm AEST	Lecture 4	**Temporal Discretization** • Time-accurate schemes for unsteady flows • Convergence acceleration techniques for steady flows Distributed solution of sparse linear systems	Dr Rowan Gollan (UQ)
W3	**Mathematical Models and Discretization Basics II**		
12 Sep Tuesday 1-2:10pm AEST	Lecture 5	**Spatial Discretization/Analysis** • Finite difference methods • Finite volume methods • Assembly of systems of equations	Prof Emile Sauret (QUT)
14 Sep Thursday 1-2:30pm AEST	Tutorial 1	**Discretization of Test Problems** • Stability of schemes • Numerical diffusion • Grid convergence • Wave propagation example (e.g. upwinding vs central, Euler explicit vs implicit)	Dr Zhongzheng Wang (QUT)
W4	**Mapping of CFD to HPC**		
19 Sep Tuesday 1-2:10pm AEST	Lecture 6	**Parallelization Concepts** • MPI, OpenMP, Open ACC, hip/cuda • Profiling, scaling, performance • Debugging	**Dr Callum Atkinson** (Monash)
20 Sep Wednesday 1-2:30pm AEST	HPC Training Session for Beginners (Optional)	**Interacting with HPC** • Working from a command-line interface • Scripting for queueing and batch execution	**Fred Fung** (NCI)

		• Running your first HPC job	
21 Sep Thursday 1-2:30pm AEST	Tutorial 2	**Hands-on Parallelization**	**Atkinson** Team + NCI Staff
One Week Break			
W5	**Handling and Postprocessing Data**		
3 Oct Tuesday 1-2:10pm AEST	Lecture 7	**Postprocessing Large Data Sets** • File systems (HDF5, netcdf etc.) • POD, DMD, EOF • In-situ and data driven post-processing	**Dr Andrew Kiss** (ANU)
5 Oct Sept Thursday 1-2:30pm AEST	Tutorial 3	**Data Processing Examples** • Scripted interrogation • In situ data extraction/manipulation • Approaches to visualisation • Verification and validation	**Kiss** team + NCI Staff
W6	**Advanced Methods**		
10 Oct Tuesday 4-5:10pm AEST / 8-9:10am CEST	Lecture 8	**High-Order Discontinuous Galerkin Schemes on Unstructured Grids** • Overview • Discontinuous Galerkin Spectral Element Method • Treatment of curved boundaries • Stabilization techniques for turbulent flows	Michael Bergmann (DLR Germany)
12 Oct Thursday 1-2:10pm AEST	Lecture 9	**Turbulence Modeling** • DNS • LES • (u)RANS • Data-driven turbulence modelling	**Prof Richard Sandberg** (UniMelb)
W7	**Advanced Topics**		

17 Oct Tuesday 1-2:10pm AEST	Lecture 10	**Multiphase Flows** • Discrete phase modelling • Euler-Euler modelling • Volume of Fluid modelling	Prof Matthew Cleary (USyd)
19 Oct Thursday 1-2:10pm AEST	Lecture 11	**Fluent Capabilities**	Dr Lewis Clark (LEAP Australia)
W8	**Ansys Fluent on HPC - Industry Showcase**		
24 Oct Tuesday 1-2:30pm AEST	Tutorial 4	**Hands-on Fluent on HPC**	**Dr Lewis Clark** (LEAP Australia) + NCI Training
26 Oct Thursday 1-2:30pm AEST	Tutorial 5	**Hands-on Fluent on HPC**	**Dr Lewis Clark** + NCI Training (LEAP Australia)
W9	**OpenFOAM on HPC - Industry Showcase**		
31 Oct Tuesday 1-2:10pm AEST	Lecture 12	**The Flavors of OpenFOAM** • OpenFOAM - what it is and is not • History of OpenFOAM • The three major flavours of OpenFOAM with a comparison of capability • Why use OpenFOAM • OpenFOAM architecture • OpenFOAM implemented capabilities – ESI version • Some examples • Conclusions	**Dr Darrin Stephens** (Laminar 2 Turbulent)
2 Nov Thursday 1-2:30pm AEST	Tutorial 6	**Hands-on OpenFOAM on HPC**	**Dr Darrin Stephens** (Laminar 2 Turbulent) + NCI Training
W10	**Advanced Topics**		
7 Nov Tuesday	Lecture 13	**Discrete Methods for CFD**	A/Prof Christopher Leonardi (UQ)

1-2:10pm AEST		• Smoothed particle hydrodynamics • The Boltzmann equation • Lattice Boltzmann methods	
9 Nov Thursday 1-2:10pm AEST	Lecture 14	**CFD for Hypersonics** • Challenges at high-speed • Combustion	**Dr Rowan Gollan** (UQ)
W11	**Advanced Topics**		
14 Nov Tuesday 1-2:10pm AEST	Lecture 15	**CFD (DNS/LES) of Oceanic Flows** • Small scales • Internal waves, • Ice-ocean interaction • Upper ocean mixing • Ocean heat transport • Coastal ocean	A/Prof Bishakhdatta **Gayen** (UniMelb)
16 Nov Thursday 1-2:10pm AEST	Lecture 16	**Large-Scale Ocean Modelling** • Southern Ocean • Global heat transport • Circulation Antarctic margin • Climate change scenario	**A/Prof Bishakhdatta Gayen** (UniMelb)
W12	**Advanced Topics**		
21 Nov Tuesday 1-2:10pm AEST	Lecture 17	**CFD for Turbomachinery** • The challenges with deterministic unsteadiness • Moving towards more realistic setups	**Prof Richard Sandberg** (UniMelb)
23 Nov Thursday 1-2:10pm AEST	Lecture 18	**Suspension Transport** • small-scale, fully resolved simulations **Closing Remarks**	**A/Prof Christopher Leonardi** (UQ)
~ End ~			



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