

University of Pretoria Yearbook 2019

Numerical thermoflow 781 (MSM 781)

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| Qualification | Postgraduate |
| Faculty | Faculty of Engineering, Built Environment and Information Technology |
| Module credits | 16.00 |
| Programmes | BEngHons Mechanical Engineering BScHons Applied Science Mechanics BScHons Applied Science Mechanics: Physical Asset Management |
| Prerequisites | MSM 780 Numerical thermoflow 780 |
| Contact time | 21 contact hours per semester |
| Language of tuition | Module is presented in English |
| Department | Mechanical and Aeronautical Engineering |
| Period of presentation | Semester 2 |

Module content

The Efficient Solvers: Background, multigrid theory and detailed description of the algorithm. Finite Volume method: Understand the governing equations, general form of the transport equations, Gauss's theorem and the finite volume discretisation. Iterative solution algorithm: Pressure-velocity coupling, types of grids, unsteady flows, multiple phases. Finite Volume Discretisation: Diffusion term, convection term and source term for steady flows. Convection-diffusion problems: Boundary conditions, higher order discretisation, accuracy / stability. Solution Algorithm for Pressure-Velocity coupling: SIMPLE, SIMPLER, SIMPLEC and PISO. Laminar, transitional and turbulent flow: Background and theory. Turbulence modelling and examples: Definition of turbulence, turbulence modelling approaches, turbulence models (zero-equation models, one equation, two equation, Reynolds Stress Model (RSM), Large Eddy Simulation, wall function approach), turbulence modelling guidelines. Recent CS developments: Current state of the art in turbulence modelling etc. Viscous boundary meshes: Background and objectives, internal and external flow, turbulence modelling considerations.

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