CFD for Turbomachinery

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Module 1 Governing Equations

Lecture 1.0	Orientation to the Course
Lecture 1.1	Introduction to Fluid Dynamics
Lecture 1.2	Blade Element Theory
Lecture 1.3	Governing Equations in a Stationary Frame of Reference (Viscous Flows)
Lecture 1.4	Governing Equations in Stationary Frame of Reference (Inviscid Flows)

Lecture 1.5	Governing Equations in Rotating Frame of Reference (Inviscid and Viscous Flows)
Lecture 1.6	Passage Averaged Equations and Turbomachinery Blade Design
Lecture 1.7	Reynolds Averaged and Filtered Navier – Stokes Equations
Lecture 1.8	RANS Turbulence Modelling – 1
Lecture 1.9	RANS Turbulence Modelling – 2

Module 2 Solids Modelling

Module 3 Mesh Generation

Lecture 3.1	Introduction
Lecture 3.2	Methods for Structured Mesh Generation
Lecture 3.3	Successive Layer Grid Generation
Lecture 3.4	Differential Equation Based Schemes
Lecture 3.5	Control Functions and Adaptive Grid Generation
Lecture 3.6	Unstructured Mesh Generation
Lecture 3.7	Hybrid Grids and Grid Independence Study

Module 4 Computational Methods

Lecture 4.7	Finite Volume Discretization
Lecture 4.8	Numerical Illustrations
Lecture 4.9	Finite Volume Method with Structured and Unstructured Grids

Module 5 Solvers

Lecture 5.1	Solving Linear System of Equations
Lecture 5.2	Iterative Methods
Lecture 5.3	Numerical Schemes for Incompressible Flow Equations
Lecture 5.4	Methods based on Coupling of Pressure and Velocity
Lecture 5.5	Incompressible Flow Solvers

Lecture 5.6 Numerical Illustration

Lecture 5.7 Compressible Euler Equations

Lecture 5.8 Flux Vector Splitting

Module 6 Case Studies

Lecture 6.1	A CFD Code for Turbomachinery Flows
Lecture 6.2	Internal Inviscid Flows
Lecture 6.3	Transonic Flow Through a NACA0012 Airfoil Cascade
Lecture 6.4	Unsteady Flow Evolution in a Channel by a Step
Lecture 6.5	Turbine Cascade
Lecture 6.6	Interacting Stator and Rotor Cascades- Inviscid flow