Computational Fluid Dynamics

Course Information

by
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BMM4783
Computational Fluid Dynamics

Synopsis

This course aims to introduce the fundamental and application of simulation of fluid mechanics and heat transfer phenomenon and solving thermo-fluids problem via computational method. Holistic approaches of programming and commercial software are essential towards solving, analyzing and evaluating the results of thermo-fluid problem-based. It focuses on solving of two and three dimensional fluid flow and heat transfer problems utilize commercial softwares.

Course Outcomes

- In CFD, fluids that are in motion are simulated and analyzed. In most cases, the influence of the flowing fluid behavior on other processes need to be taken into consideration.
- in CFD, the motion of the fluid is represented in a form differential equations, which govern a process of interest and are often called governing equations.
- The governing equations are converted to systems of algebraic equations which can easily be converted into computer programs.

Course Outcomes

At the end of this course, students should be able to:

CO1: **Solve and analyze** the governing equations in thermo-fluid problems.

CO2: **Apply** basic discretization methods to solve thermo-fluid problems

CO3: **Apply** solution algorithms for pressure-velocity coupling in steady flows

CO4: **Apply commercial software** to solve, analyze and evaluate thermo-fluid problem.

Course Schedule

- **Lecture: 2 hrs/wk - @M21BT5**

  Monday 10:00 - 12:00

- **Lab: 2 hrs/wk - @M11F1B**

  Friday 10:00 - 12:00

Chapters to be covered

1. Introduction to Computational Fluid Dynamics
2. Fluids in motion
3. Discretization method in CFD
4. Solution algorithms for pressure---velocity coupling in steady flows
5. Simulation of fluid dynamics problem using commercial software
6. Evaluate and validate the simulation results of thermo-fluid problems

References

1. J. Tu, G.H. Yeoh, C. Liu, Computational Fluid Dynamics : A Practical Approach, Elsevier, 1st Edition, 2008.
2. C.T. Shaw, Using Computational Fluid Dynamics, Prentice Hall, 1992
3. H K Versteeg and W Malalasekera, An Introduction to Computational Fluid Dynamics, The Finite Volume Method, Pearson Prentice Hall, 2017
4. J. C. Tannehill, D. A. Anderson and R.H. Pletcher, *Computational Fluid Mechanics and Heat Transfer*, 3rd Edition, 2011
5. *ANSYS Fluent Theory Guide*, Release 13, Ansys Inc., 2013

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Research interest:

- Computational Fluid Dynamics,
- Thermo-fluids,
- Multidisciplinary Numerical Modelling and Simulation

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