

International Short Course Announcement

Flow Transition and Turbulence - Physical Nature and DNS Code Release

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<http://www.uta.edu/math/courses/FTT09/>

1. Date: May 11-15, 2009

2. Place: University of Texas at Arlington, Texas, USA

3. Principal Lecturer

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4. Content:

Part I Physical Nature - Turbulence Origin in Boundary-Layer Flows, Predominant Mechanisms and Applications (Yury S. Kachanov)

- 1) Introduction
- 2) What is turbulence? The problem of its definition and the solution of this problem.
- 3) Turbulence origin and its practical significance.
- 4) Transition scenarios and characteristic stages.
- 5) Classes and types of instability of laminar boundary layers.
- 6) Basic ideas of experimental approaches to the transition and turbulence researches.
- 7) Three bright examples of flow instabilities.
- 8) Boundary-layer receptivity to various external perturbations.
- 9) Three bright examples of the boundary-layer receptivity problems.
- 10) Nonlinear interactions of instability modes. Role of resonances.
- 11) Formation of vortical structures at late stages of turbulence origin and their universality.
- 12) Turbulence production mechanisms in transitional and turbulent flows and their similarity.

- 13) Deterministic turbulence – myth or reality?
- 14) Transition prediction approaches.
- 15) Control of boundary layer transition.
- 16) Control of turbulent boundary layers.
- 17) Concluding remarks.

Part II Direct Numerical Simulation for Flow Transition (Chaoqun Liu)

- 1) Governing equations of fluid motion
- 2) Detailed conservative Navier-Stokes equation in a curvilinear coordinate
- 3) Orthogonal body-fitted grid generation
- 4) High order compact scheme and filter
- 5) High order formula for boundary grid points
- 6) Runge-Kutta and implicit time marching
- 7) Universal high order subroutine for conservation and accurate numerical derivatives
- 8) MPI parallel computation
- 9) Numerical examples of flow transition

Part III DNS Code Release and Practice (Chaoqun Liu)

5. Contact:

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