Course: Fluid Dynamics and Turbulence Modeling (A. Soldati, L. Sigurdson, C.

	Day	Topic	Lecturer	Lecture Hours	Tutorial Hours
tue	28/09/10	Introduction to Course	AS/LS	1	
thu	30/09/10	Conservation Equations, Kinetic Energy Transport Equation	AS	2	
tue	05/10/10	Vorticity Dynamics - definitions, vorticity, physical significance of mathematical definition, circulation; Birth, diffusion, and death of vorticity, Stokes' first problem;	LS	2	
thu	07/10/10	Vorticity Dynamics - Viscous flow inside and outside a rotating cylinder, diffusion length scale	LS	2	
tue	12/10/10	Vorticity Dynamics - Vorticity Equation, potential and stream functions	LS	2	
thu	*14/10/10*	*Seminar: Large-Scale structure and flow control research at the vortex fluid dynamics Lab I*	*LS*		*2*
tue	*19/10/10*	*Homework: 2D lid-driven cavity flow*	*CM*		*2*
thu	21/10/10	Laminar boundary layer	AS	2	
tue	26/10/10	*Homework: laminar boundary layer on a flat plate (Blasius, Stokes) + free plane jet*	*CM*		*2*
thu	28/10/10	Turbulence: basic concepts	AS	2	
tue	**02/11/10**	**HOLIDAY**			
thu	04/11/10	RANS (Reynolds-Averaged Navier-Stokes) equations, Reynolds stress tensor	AS	2	
tue	09/11/10	Closure problem for RANS equations	AS	2	
thu	11/11/10	Turbulent Boundary Layer	CM	2	
tue	16/11/10	Statistical Analysis of Turbulence	CM	2	
thu	18/11/10	Statistical Analysis of Turbulence	CM	2	
tue	**23/11/10**	**TBA**			
thu	*25/11/10*	*Homework: Statistical analysis of a turbulent velocity field*	*CM*		*2*
tue	30/11/10	Vortex Dynamics - Biot-Savart Law, Comments on vorticity field, Helmholtz's Theorem, point vortices, 2-D vortex motions, basic vortex interactions	LS	2	
thu	*02/12/10*	Discrete Vortex Method - modeling using discrete vortices, application to shear layer	LS	2	
tue	*07/12/10*	*Homework: Discrete Vortex Motion*	*LS*		*2*
thu	*09/12/10*	*Seminar: Large-Scale Structure and Flow Control Research at the Vortex Fluid Dynamics Lab II*	*LS*		*2*
tue	*14/12/10*	Turbulence Models: zero-, one- and two-equation model (K-ε Model)	AS	2	
thu	16/12/10	Turbulence Models: zero-, one- and two-equation model (K-ε Model)	AS	2	
tue	21/12/10	*Homework: K-e model applied to steady flow in a 2D channel*	*CM*		*2*
thu	**23/12/10**	**HOLIDAY UNTIL SUNDAY JANUARY 9, 2011**			
tue	11/01/11	Hydrodynamic Instability - Historical Background to Turbulence Modeling	LS	2	

thu	13/01/11	Hydrodynamic Instability- Large Scale Structures (LSS) • experimental evidence in shear layers (primary and secondary instabilities) • vortex rings (analytical, experimental, computational):alone, interacting *if time permits:* boundary layer turbulent spots, hairpins; Crow-instability (counter-rotating pairs); wakes/jets; jets in crossflow (transverse jets); reattaching flows	LS	2	
tue	18/01/11	Hydrodynamic Instability - introduction to linear instability theory	LS	2	
thu	20/01/11	Introduction to Multiphase Turbulent Flows	CM	2	
tue	*26/01/11*	*Homework: Lagrangian Tracking in 2D Flow*	*CM*		*2*
				39	**16**