MIE1207F   2018

Instructor   Prof. P. Sullivan   Rm MC225   x 83110
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             (please use subject MIE1207F)

Text

             Turbulence and Random Processes in Fluid Mechanics, M.T. Landahl and E.
             Mollo-Christensen
             Review notes

             Lectures Wednesday 10 am in MC-310

September	October	November	December
September 12, 2018	October 3, 2018	November 7, 2018	
September 19, 2018	October 10, 2018	November 14, 2018	
September 26, 2018	October 17, 2018	November 21, 2018	
	October 24, 2018	November 28, 2018	
	October 31, 2018		

November 21, 28 are scheduled for presentations

Final Mark
Homework   15%
Presentation 25%
Project 60%

Material to be covered

1   Basic Equations
2   Statistical Tools
3   Homogeneous and Isotropic turbulence
4   Shear Flows
5   Boundary Layer Flows
6   Experimental Methods
7   Numerical Methods

LECTURE NUMBER	CONTENT
1	Qualitative introduction to turbulence. Experimental evidence for turbulence, transition from laminar to turbulent flow, Kolmogorov scales and the associated energy cascade from non-dimensional analysis, Closure problem of turbulence.
2-3	Equations of turbulence and fluid mechanics Introduction to Vortex dynamics Case Study 1: Experiments and Equations
4-6	Origins of Turbulence Brief discussion on non-linearity and chaos (general overview) Impact of these ideas on fully-developed turbulence Statistical approach to turbulence Averaging and impact on statistics Kolmogorov's theory Case Study 2: Experiments and Equations
7-8	Examples of Turbulent Shear Flows (TBL, Homogeneous Shear and Free Shear (Jets and Wakes)) Log Law of Wall One-point closure as an introduction to k-epsilon Brief discussion on Large Eddy Simulation Case Study 3: Experiments and Equations
9-10	Richardson, Taylor and Kolmogorov theories and continuing impact on turbulence theory Energy Cascade and vortex stretching Turbulent diffusion
11	Discussion on experimental methods – Hotwires, LDA and PIV Closure with relation to course project.