MIE1207F 2020

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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
14-Sep-20	5-Oct-20	2-Nov-20	
21-Sep-20	12-Oct-20	9-Nov-20	
28-Sep-20	19-Oct-20	16-Nov-20	
	26-Oct-20	23-Nov-20	
		30-Nov-20	

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.