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Turbulence - Course Syllabus

Course Number: ME 307

Course Title: Turbulence

Academic Semester:	Spring	**Academic Year:**	2015/ 2016
Semester Start Date:	Jan 24, 2016	**Semester End Date:**	May 19, 2016

Class Schedule: Not available

Classroom Number:

Instructor(s) Name(s): Sigurdur Thoroddsen
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Office Location: Building 4, Room 2218

COURSE DESCRIPTION FROM PROGRAM GUIDE

Introduction to turbulence. Fundamental equations of turbulent flow. Statistical description of turbulence. Experimental methods for turbulence. Reynolds equations. Kolmogorov's theory. Scales of turbulence. Homogeneous turbulence. Free-shear flows. Bounded flows. Boundary layers. Simulating turbulent flows. Reynolds Average Navier- Stokes approach. Introduction to Large Eddy

COMPREHENSIVE COURSE DESCRIPTION

Introduction to turbulence. Fundamental equations of turbulent flow. Statistical description of turbulence. Experimental methods used in studying turbulent flows. Reynolds equations. Kolmogorov's theory. Scales of turbulence. Homogeneous or isotropic turbulence. Energy transfer. Spectral description. Turbulent free-shear flows. Bounded flows. Boundary layers. Simulating turbulent flows. Reynolds Averaged Navier-Stokes approach. Introduction to Large Eddy Simulations. Two-dimensional turbulence.

GOALS AND OBJECTIVES

Introduce the basic properties of turbulence: Random vortical fluctuating structures over a large range of length- and time-scales. Introduce the importance of turbulent mixing and transport of momentum in practical flows. Expose the students to theoretical, numerical and experimental techniques used to describe and quantify the effects of turbulence.

REQUIRED KNOWLEDGE

Prerequisites: Basic fluid mechanics: ME200a & b, or equivalent. Differential equations: AMCS 201 and 202 or equivalent. Or instructor permission.

REFERENCE TEXTS

Steven A. Pope (main text): Turbulence, Cambridge (2004).

P. A. Davidson (secondary text): Turbulent Flows, Oxford (2000)

Tennekes & Lumley (Supplementary text): A first course in turbulence (1972)

METHOD OF EVALUATION

Percentages %	Graded content
20%	**Bi-weekly Home-Work**
25%	**Midterm Exam**
25%	**Individual term-paper and presentation**
30%	**Final Exam**

COURSE REQUIREMENTS

Assignments

Individual homeworks, due bi-weekly.
Individual term-paper and presentation on a selected topic, or laboratory experiment.

Course Policies

Student attendance is mandatory.

NOTE
The instructor reserves the right to make changes to this syllabus as necessary.