AEROACOUSTICS OF LOW MACH NUMBER FLOWS

A Short Course

Stewart Glegg and William Devenport

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Università degli studi Roma Tre,
Department of Civil, Computer Science and Aeronautical Technologies Engineering, in Via Vito Volterra 60 Classroom N11.

AGENDA

9 am	Introduction to Course
9.15 am	**Introduction to Aeroacoustics**
9.45 am	**Fundamentals and Linear Acoustics (Chapter 2 & 3)**
10.45 am	Discussion
11 am	Break
11.15 am	**Lighthill's Acoustic Analogy (Chapters 4 & 5)**
12.45 pm	Discussion
1 pm	Lunch
2.30 pm	**Turbulent Flows (Chapters 10,11, & 12)**
3.45 pm	Discussion
4.00 pm	Break
4.15 pm	**Propeller and Open Rotor Noise (Chapters 6 & 7)**
6.00 pm	Discussion
6.30 pm	Adjourn

Materials available at Aeroacoustics.net/ShortCourse

DETAILED LIST OF LECTURE TOPICS

Introduction to Aeroacoustics

(1) Aerodynamic Noise
(2) What makes Noise
(3) Surfaces and sound
(4) Sound from Flow
(5) Surface flow noise

Fundamentals and Linear Acoustics

(1) Continuity and momentum
(2) Compressibility
(3) Linearization
(4) Wave equation
(5) Simple Boundary conditions-monopole source
(6) Superposition, and the acoustic far fields
(7) Dipole source motion
(8) Quadrupole source motion

Lighthills Acoustic Analogy and the FW-H equation

(1) The concept, NS=0
(2) Lighthills Wave equation
(3) The free field solution
(4) Near field and far field sound, scaling on U^8
(5) Limitations
(6) Surfaces, the FWH equation
(7) Moving sources
(8) Dipole, thickness and edge noise
(9) Scaling on flow speed

Turbulent Flows

(1) Stochastic processes and the expected value
(2) Time spectra and correlations
(3) Cross correlations and cross spectra
(4) Wavenumber spectra
(5) Turbulence and aeroacoustics
(6) Homogeneous isotropic turbulence
(7) The plane wake
(8) Zero pressure gradient turbulent boundary layer

Propeller and Open Rotor Noise

(1) Tone and broadband Noise, typical systems
(2) Time Domain Methods, Loading and Thickness noise
(3) Frequency Domain methods

(4) Amiet's approximation
(5) Unsteady blade loading
    Sears response function
    Amiet's compressible response function
(6) Blade in a turbulent stream
(7) Trailing edge noise
(8) Leading Edge Noise Example