

Week 14: Reading & Homework Assignment # 11

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Course Textbook(s): Physics 406 Lecture Notes (posted on P406 website – see below)
“The Science of Sound”, 3rd Ed. Rossing, Moore & Wheeler, Addison-Wesley

Another good book: “The Acoustical Foundations of Music” 2nd Ed., John Backus, Norton

Course Website: <http://courses.physics.illinois.edu/phys406/>
<http://courses.physics.illinois.edu/phys193/> ←

Freshman “Discovery” POM Course (less technical)

All lecture notes, lab handouts, additional references, previous student final project reports (and much more) are available on the P406 (and P193) website(s). Please check these out!

Course Organization:

A. Lectures: Tuesdays & Thursdays, 12:30-1:50 pm, in the POM Lab (6105 ESB).
We will also have various demos using equipment in the POM Lab (6105 ESB).

B. Friday Labs: Lab1 @ 11:00 am -1:50 pm, Lab2 @ 2:00-4:50 pm in the POM Lab (6105 ESB)

First part of the semester will consist of doing various simple/short experiments using equipment and/or software in the lab. Will discuss this in the 1st lab session(s) this coming Friday. Second part of semester, labs will be focused on student project(s) – more on this below.

C. Weekly Reading and Homework Assignments: HW due *following* week on Thursday, in class.

D. Take-Home Midterm Exam: Tuesday, March 7, 2017, **Due:** Thursday, March 16, 2017

E. Midterm Project Oral Presentations: Brief! In class – Tues & Thurs, March 7 & 9, 2017

F. Final Project Oral Presentations: Brief! In class – Thurs, April 27 & Tues, May 2, 2017

G. Take-Home Final Exam: Tuesday, April 25, 2017, **Due:** Friday, May 5, 2017

H. Final Project Written Report: **Due:** Friday, May 12, 2017

i.e. 9
days
later

Reading Assignment For Week 14: Please read Physics 406 Lect. Notes XV.

Homework Assignment For Week 14: See Below.....

Final grade based on:

Σ HW's: 20%

MT: 15%

FE: 30%

FP: 35% (= Σ mid-term & final oral presentations, final written report).

Homework Assignment For Week 14: n.b. this is called HW # 11 !!!

- 1.) In P406POM Lect. Notes 13, p. 2, work through the basic-physics derivation of how a **dynamic** microphone produces a voltage signal $\tilde{\epsilon}_{coil}(t)$ in the presence of an over-pressure amplitude $\tilde{p}(\vec{r}, t)$.
- 2.) In P406POM Lect. Notes 13, p. 3-4, work through the basic-physics derivation of how a **condensor** microphone produces a voltage signal $V_R(t)$ in the presence of an over-pressure amplitude $\tilde{p}(\vec{r}, t)$.
- 3.) In P406POM Lect. Notes 13, p. 5, work through the basic-physics derivation of how an **electret condensor** microphone produces a voltage signal $V_{gap}(t)$ in the presence of an over-pressure amplitude $\tilde{p}(\vec{r}, t)$.
- 4.) In P406POM Lect. Notes 13, p. 7, starting from the information contained on the y-axis of the frequency response graph, work through the derivation of the **sensitivity** of the Knowles FG-23329 condensor microphone, $S_{p-mic} = 22.4 \text{ mV/Pa}$.
- 5.) In P406POM Lect. Notes 13, p. 9-10, work through the Euler equation derivation of how the 1-D particle velocity $\tilde{u}_z(\vec{r}, t)$ can be inferred from measurement of the pressure **gradient** using a **pair** of pressure microphones separated by a distance Δz (*i.e.* using the so-called **p-p method**).
- 6.) Turn in your above derivations as **HW # 11**.