Fall Term, 2016

Syllabus: PHY3100, "The Sounds of Music"

Instructor: J. C. Conn
Office: 220 Physics Research Building
Phone: 313-577-7816
Email: af8229@wayne.edu
Office Hours: Students are welcome to meet with me after class or at another arranged time.

Class Meetings:

	day(s)	time	room	course ref. no.	section
Lecture	T & Th	11:45-1:10	410 STA	12702	001
Lab	W	11:45-1:45	115 PHY	12705	003
	T	9:35-11:35	115 PHY	12706	005

Course Description: Prereq: sophomore standing. Meets General Education Laboratory Requirement. For music majors and other students interested in the physical foundations of the production, perception, and reproduction of musical sounds. Makes only limited use of simple mathematics. Includes topics such as wave properties, loudness levels and the human ear, hearing loss, tone quality, frequency and pitch, musical intervals and tuning, room acoustics, the production of sound by various musical instruments, and electronic reproduction of music. This is a 4-credit course.

Student Learning Outcomes. Identify and describe the physical phenomenon of sound, physical systems that produce sound, production and character of sound from musical instruments and the human voice, the construction and operational features of the human ear.

Required Text: *The Physics of Sound,* third edition by Richard E. Berg and David G. Stork, Pearson, (2005); ISBN 0-13-145789-6. This book can be purchased used for about $70 or rented for about $40 from reputable internet sellers such as amazon.com and barnesandnoble.com. At the WSU Barnes and Noble bookstore the textbook price is about $124 used and $75 for rental. The course will follow a subset of the text, and appropriate sections for reading are included in the detailed class schedule.

Exams. There will be three exams, of equal weight in grading. Exams are closed book.

Homework Problems. Homework problems will be assigned. These problems will be due one week after they are assigned. Credit will be given for reasonable attempts.

In-Class Problems/Presentations. Certain problems will be given to students to be worked on both during and outside of class, in the learning community fashion. Working in groups of 3-4 students, solutions to the problems will be presented by each group during class time periods, on a regular basis.

In the above two categories regarding problems, credit is given for reasonable attempts.

Attendance and Class Participation. Students are expected to attend class regularly. Attendance will be taken.

Laboratory. There are 10 labs. To get credit for a lab, attendance is required and a written report is due at the end of the lab session, or with permission of the instructor, within a week after the lab session. The lab manual will be made available on the course website. Students are responsible to print out their own copy of each lab and bring it to the lab session.

Grading. The course grade has the following components:
50% - exams, after dropping the lowest-score (or missed) exam
15% - lecture class attendance & activities (including group problems/presentations), after dropping up to three missed classes
10% - homework, after dropping the lowest score or missed assignment
25% - lab reports, after dropping the lowest-score (or missed) lab

The course grade will be assigned according to the total number of percentage points as follows.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
90-100	85-89	80-84	75-79	70-74	65-69	60-64	55-59	50-54	45-49	40-44	0-39

Policy on Missed Work. There are no make-up exams or labs. The grading scheme, dropping the lowest-score (or missed) exam and lab, and dropping credit for up to three missed lecture class activities, will accommodate routine illness and personal contingencies.

Note: Generally, if a student is registered for the course a regular grade will be given. A grade of incomplete (I) will be given only in exceptional cases (to accommodate illness or emergency).

Student Disability Services. If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TTY: telecommunication device for the deaf; phone for hearing impaired students only). Please discuss your registered accommodations with the instructor.

PHY3100 Class Schedule

Note: The Schedule may be revised during the term. Any changes will be announced in class and posted on Blackboard.

Lec. Date	Topic	Sections	Lec. #	Lab (M, T, or W)
Sep. 1	Introduction: Physical Units; Basic Physics		1	No lab
Sep. 6 Sep. 8	Introduction cont.; Simple Harmonic Motion	1.1-1.2	2 3	No lab
Sep. 13 Sep. 15	Damped, Driven, and Combined Oscillations Transverse and Longitudinal Waves,	1.3-1.4	4 5	No lab
Sep. 20 Sep. 26	Reflection, Refraction Interference, Diffraction	2.1-2.2	6 7	Simple Vibrating System
Sep. 27 Sep. 29	Addition of Waves, Beats Standing Waves, Harmonic Series	2.2-2.3	8 9	The Oscilloscope
Oct. 4 Oct. 6	Huygen's Principle, Superposition, Inverse Square Law, Polarization, Doppler Effect	2.4-2.5	10 11	Properties of Waves
Oct. 11 Oct. 13	Standing Transverse Waves, Mersenne's Laws, Tube or Column Waves; Review **Exam 1**	3.1 3.2 3.3-3.4 **1.1-3.1**	12 **(1-12)**	Beats, Tuning, and Pitch
Oct. 18 Oct. 20	Fourier Synthesis & Analysis Fourier Analysis & Resonance	4.1-4.2 4.2, 4.4	13 14	Standing Waves on Strings
Oct. 25 Oct. 27	Hearing Physiology, Place Theory Hearing & Intensity Hearing Perception	6.1-6.2 6.3-6.4 6.5-6.8	15 16	Standing Waves in Air
Nov. 1 Nov. 3	Binaural Hearing & Hearing Loss Voice Physiology	6.9-6.11 6.12-6.13 6.13-6.14	17 18	Sound Levels
Nov. 8 Nov. 10	Room Acoustics, Review **Exam 2**	8.1-8.3 **3.3-6.12**	19 **(12-18)**	No lab
Nov. 15 Nov. 17	Musical Temperament and Pitch Recorder, Flute, Clarinet Saxophone, Oboe, Bassoon, Organ	Appendix A, 9.1-9.3, 9.7 10.1-10.4 10.5-10.7, 10.9	20 19	Ear Sensitivity
Nov. 22 Nov. 24	(Thanksgiving Break)		21	No lab

Nov. 29 Dec. 1	Trumpet, Trombone, and Horn Violin, Harp, Guitar	11.1-11.5 12.1-12.4	22 23	Musical Instruments
Dec. 6 Dec. 8	Piano, Bar Percussion, Tympani Remaining material; review	13.1-13.3, 14.1, 14.3	24	Musical Intervals
Dec. 13 Dec. 16 **(F)**	(Study Day) **Exam 3** (10:40-1:10)	**6.13-14.3**	**(19-24)**	