

The King's University

PHYS 399/MUSI 399

Winter 2019

The Physics of Music

Background: The following course proposal has arisen from a long-standing role that the Physics program at King's has played with the Music program in delivering a series of lectures (usually in the fall term) on the physics of music. These lectures are always well received and usually met with a genuine interest (on the part of music students) to explore these ideas further – hence rationale for a course devoted to this topic. At the same time, music is a universal part of the human experience and certainly a topic that will be of interest to physics students. This course is intended to encourage a mutually enriching conversation between the musicians and physicists!

Main Features of PHYS 399/MUSI 399:

- The course is cross-listed as a senior level Physics or Music course. This is to avoid 200-level course credit over-load and provide an additional senior level physics course. (There is precedent – BIOL 362/PSYC 375) This means that the course will come with the following pre-requisites:

One of: PHYS 241, 243, MUSI 200

- The course will include a lab/project component and will provide a course through which students from Music and Natural Science Faculties can meet respective program distribution requirements
- Course will be delivered by 1 primary instructor from Physics with guest participation from members of the Music Faculty
- Summary of course features are on the following page:

Course Title: The Physics of Music

Course Code: Phys 399/Musi 399

Year: Winter 2019

Pre/co-requisite Courses: one of Phys 241,243 , Musi 200

Course Objectives: The course will introduce the physics of music through a series of topics and lab projects.

Course topics:

1. Nature of Sound
2. Waves and Vibration
3. Sources of Sound
4. Sound Propagation and Resonance
5. Sound Energy, Intensity and its Measurement
6. The Human Ear
7. The Elements of Musical Sound
8. Sound Spectra and Musical Instruments
9. Percussive sound and Percussion Instruments
10. Vibrating Strings and Stringed Instruments
11. Vibrating Pipes and Reeds – Woodwind and Brass Instruments
12. The Human Voice
13. Room Acoustics

Lab Projects:

1. Measuring the physical properties of sound
2. Resonance
3. Building a Native American Flute
4. Building a Stringed Instrument
5. Building a tuned-chime
6. Spectral analysis of human voice
7. Wrap-up project

Course Requirements and Grading: There will be:

- Weekly lab and written assignments 50%
- 1 midterm exam 20%
- 1 final exam 30%.

Course Outline: (3-0-3)

The course will meet weekly for 3 hours lectures and 3 hours lab

Required Text:

David R. Lapp, *The Physics of Music and Musical Instruments (free online)*