

*This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.*

Department of Science  
Borough of Manhattan Community College  
The City University of New York

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The Physics of Music	Prof. Emil Buktenica
Physics 400	Lecture Hours: 3
4 Credits	Lab Hours: 2

**Course Description:** In this course we will use concepts and techniques of Classical Physics and Mathematics to investigate the nature of sound and especially of music. The production, propagation and perception of musical sound will form the heart of the course. The student will become acquainted with the tools and techniques used by modern producers and musicians.

**Pre- or Co-requirements:** Basic first year college Liberal Arts Mathematics and Science concepts and skills will be reviewed in the course as required.

**Required Text:** "Good Vibrations: The Physics of Music" by Barry Parker; Johns Hopkins University Press.

**Grading:** Exams: 60%; Laboratory: 20%; Final Exam: 20%

### Lecture Syllabus

<u>Week</u>	<u>Topics</u>
1	Measurable quantities, Units, One dimensional motion and Newton's Laws
2	Hooke's Law; The Simple Harmonic Oscillator; The Pendulum; The Spring Oscillator
3	Waves and Their Properties; The Fundamental Relation; Sound and Beats
4	Standing Waves; Modes of a Vibrating String; Overtones and Timbre
5	Hearing; The Decibel Scale; The Fletcher Munsun Curve
6	The Ear and the Voice
7	Basic Room Acoustics; Room Modes; Reverberation
8	Resonance and Formants

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## **Lecture Syllabus**

<b><u>Week</u></b>	<b><u>Topics</u></b>
9	Oscillators; Filters; Synthesizers
10	Sampling; Sound Design
11	The DAW; Signal Processing; Effects: EQ, Compression, Delay, Chorus and Flanging
12	Frequency Ranges of Common Instruments; Masking and Psychoacoustics
13	Producing; Mixing and Mastering Audio
14	Mathematics in Classical and Modern Music; The Golden Mean; The Fibonacci Sequence

## **Laboratory Syllabus**

<b><u>Week</u></b>	<b><u>Topics</u></b>
1	Acceleration Due to Gravity – Free Fall Apparatus
2	Simple Harmonic Motion: The Simple Pendulum
3	Simple Harmonic Motion: The Vibrating Spring
4	Wave Motion Demonstration
5	Demonstration: The Musical Keyboard
6	Resonance in a Closed Pipe
7	Resonance in a Vibrating String
8	Demonstration: The Guitar
9	Demonstration: Student Demonstrations 1
10	Demonstration: Student Demonstrations 2
11	Demonstration: Producing Electronic Dance Music
12	Electrostatics and Magnetism
13	Ohm's Law
14	To Be Announced

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**College Attendance Policy** At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

**Academic Adjustments for Students with Disabilities** Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

**BMCC Policy on Plagiarism and Academic Integrity Statement** Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's web site, [www.bmcc.cuny.edu](http://www.bmcc.cuny.edu). For further information on integrity and behavior, please consult the college bulletin (also available online).