Syllabus for

GEN 314 – The Mystery of Sound

3 credit hours

Spring 2023

I. COURSE DESCRIPTION

This interdisciplinary course explores the science behind the music we listen to and worship with. Students will learn about the role waves and frequencies play in music and their everyday lives through lecture, videos, hands-on labs, and discussions. They will discover different ways sounds are made, and gain understandingabout some of the spiritual implications of vibrations and frequencies.

II. STUDENT LEARNING OUTCOMES FOR THIS COURSE

After completing this course successfully, students will be able to:

A. Recognize and change the spiritual atmosphere as well as understand the effect of their words on the world around them.
B. Be acquainted with waves and frequencies across the spectrum, especially as they pertain to musical instruments.
C. Understand the roles that waves and frequencies play in their everyday lives.
D. Understand how sounds are made on various types of instruments.
E. Understand developments in physics and music across time from around the world.
F. Understand the power of prayer in their personal lives.

III. ASSOCIATED PROGRAMS

This course meets degree completion requirements for the following programs:
This course is a scaffolded, interdisciplinary general education course.

IV. UNIVERSITY OUTCOMES

This course aligns with the following University Outcomes as indicated on the last page.

V. TEXTBOOKS AND OTHER LEARNING RESOURCES

A. Required materials:

Textbooks**:** Physics and Music: The Science of Musical Sound
White, Harvey E. and White, Donald H. Dover Publications
ISBN-13: 978-0486779348
ISBN-10: 0486779343

B. Optional materials:

None

C. Suggested Reading

Good Vibrations: The Physics of Music
Parker, Barry. Johns Hopkins University Press ISBN-10 0-8018-9264-3

Introduction to the Physics and Psychophysics of Music
Roederer, Juan. Springer Verlag NY ISBN 0-387-90116-7

VI. POLICIES AND PROCEDURES

A. Department Policies and Procedures

1. Attendance and Excessive Absences – Attendance at each class or laboratory is mandatory. Excessive absences can reduce a student's grade or deny credit for the course.
2. Unexcused Absences - Any student whose unexcused absences total nine or more of the total number of class sessions will receive an F for the course grade.
3. Computer Resources - Each student who uses the computer is given access to the appropriate computer resources. These limited resources and privileges are given to allow students to perform course assignments. Abuse of these privileges will result in their curtailment. Students should note that the contents of computer directories are subject to review by instructors and the computer administrative staff.
4. Late Exams - Each instructor has his or her own late-exam policy, so an instructor may decide that an exam missed because of an unexcused absence cannot be made up.
5. Incompletes – As stated in the University catalog, incompletes are granted only for "good cause," such as extended hospitalization, long-term illness, or a death in the family. Students must petition for an incomplete using the form available in the Computing and Mathematics Department. Very few incompletes are granted.

B. Course Policies and Procedures

1. Evaluation Procedures may vary according to instructor preferences and class scheduling needs:
    a. Two one-period examinations count for 50 points each.
    b. Homework assignments are worth up to a total of 100 points, depending on the semester schedule.
    c. Response paper worth 50 points. If used as WPA artifact, it must be submitted properly and on time to avoid receiving a 0 or a 50% deduction on the paper.
    d. Grade Categories and Weights
        i. The final exam is comprehensive and is worth 50 points.
        ii. The course grade will be determined by the percentage of total points accumulated as shown on the grading and points scales:
        A=90-100%
        B=80-89.999%
        C=70-79.999%
        D=60-69.999%
        F=below 60%
        iii. The approximate grade calculations for the class are as follows. The percentages and categories may vary somewhat depending on your instructor(s) and the

assignments given.

Final Exam is worth 50 points	50
Midterm Exam is worth 50 points	50
Homework assignments are worth 10 points each	80
Labs are worth 10 points each	80
WPA project is worth 50 pts	50
Total points possible:	310

a. Late homework will receive a penalty of 30% on all assignments not completed by the due date. Acceptance of late work is at the sole discretion of the instructor and will be considered on a case-by-case basis.

b. The course grade will be determined by the percentage of total points accumulated as shown on the grading and points scales:

A=90-100%
B=80 – 89.999%
C=70 – 79.999%
D=60 – 69.999%
F=59.999% and below

2. Whole Person Assessment Requirements:

A WPA artifact is required for this course. For specific requirements, check the WPA handbook.

3. Other Policies and/or Procedures:

a. Excessive absenteeism or discipline problems may cause a deduction in the course grade.

b. Any assignment turned in late may have points deducted. Homework assignments completed after the due date will have a 30% penalty assessed. Completing the homework is essential. The student's progress in the learning process depends on proper pacing. The best way to ensure maximum learning is for each student to give immediate attention to each assignment presented. Assignments may be written, in class, or a combination of the two.

c. Credit by examination is not available for this class.

d. If a syllabus revision is necessary for any reason, the instructor will notify the students in class, on D2L and/or by email.

VII. COURSE CALENDAR

Tentative Course Schedule:

Week 1: Unit 1 – Introduction to Waves

A. Definitions

B. Spectrum of waves and frequencies
Subaudible/Audible/Visual/Microwaves/and so on
Sound and light are composed of waves

C. Some types of waves
1. Gravity Waves
2. Sine Wave

3. Saw Wave
4. Square Wave
5. Triangular Wave

6. Ultrasonic, like Microwaves

D. Longitudinal and Transverse Waves

E. Lab comparing the four basic soundwaves

Week 2: Unit 2 – Introduction to Frequencies

A. Definitions
   1. Frequencies, including equations
   2. Person – Latin roots
   3. Calculating wavelength

B. Resonance
   1. Video demo – resonance when a frequency that matches that of a guitar's string is played.
   2. Tuning forks demo on YouTube

C. The science behind noise-cancelling headphones

D. Lab: Can you sing as high a pitch as the lowest frequency you can whistle at?

Week 3: Unit 3 – How sound travels

A. Standing waves
   1. How they are made/occur
      a. Modes, nodes, anti-nodes
      b. Relation to harmonics
   2. Video demos
   3. Slinky lab

B. Discuss the mediums sound might travel through and compare speeds
   1. Vacuum
   2. Air/Gases
   3. Water
   4. Solids

C. Diffraction, Refraction, and Reflection

Week 4: Unit 4 – Musical Scales

A. Types of scales
   1. How we got the musical scale we use today

B. Alternate tunings
   1. Tunings in other countries
   2. Wholetones – Michael Tyrell
      a. Key of David

C. Major and minor scales
   1. Stepwise description
   2. Three types of minor scales
      a. Natural
      b. Harmonic
      c. Melodic

Week 5: Unit 5 – String Instruments

A. Discussion of the string family, parts 1 and 2

B. Demo with string instruments – students will explore different playing techniques on an open string as time allows.

C. Resonance demo

D. Harmonics with octaves on strings

Week 6: Unit 6 – Wind Instruments
A. Woodwind Family
    1. How sounds are made
    2. Live demo and/or YouTube video
    3. Hands-on lab
B. Brass Family
    1. How sounds are made
    2. Live demo and/or YouTube video
    3. Hands-on lab

Week 7: Unit 7 – Synths/Electronic Keyboards
A. Types of waves used
    1. Saw
    2. Sine
    3. Square
    4. Triangular
B. Sampling methods
C. Synth demo – have students choose which voices to play, including special effects patches

Week 8: Review for and take the Midterm Exam

Week 9: Unit 8 – Drums/non-melodic instruments

Week 10: Unit 9 – "Futuristic" instruments, Acoustics
A. The theremin and encephalophone
B. Acoustics
    1. Lab comparing the acoustics in TB performance hall and the choir room

Week 11: Unit 10 – Our voices
A. How we express vocal sounds
    1. Articulators
    2. Vocal cords
    3. Breath

Week 12: Unit 11 – How Frequencies/Music affect our Atmosphere/Emotions
A. Atmosphere of a room
B. Atmosphere of the world
C. How music affects moods and emotions
    1. Movies
    2. Shopping
    3. At home
        a. Sleeping
        b. Everyday activities

Week 13: Unit 12 – Atoms, Waves and Particles
A. The composition of the atom
    1. Protons, Neutrons, Electrons
        a. Particles – God said, and it was

b. Electron orbitals
c. Vibration of particles

Week 14: Unit 13 – Vibrations, frequencies and spiritual applications

A. Research on connectedness of people
   1. Military research
   2. Other research

Week 15: Class Presentation of Whole Person Projects

Week 16: Final Exam

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This course contributes to the University and program outcomes as indicated below:
Significant Contribution – Addresses the outcome directly and includes targeted assessment.
Moderate Contribution – Addresses the outcome directly or indirectly and includes some assessment.
Minimal Contribution – Addresses the outcome indirectly and includes little or no assessment.

OUTCOMES	Significant	Moderate	Minimal
Spiritual Integrity			
GEN 314 – Encourages students to be able to recognize and change the spiritual atmosphere as well as understand the effect of their words on the world around them.		**X**	
Personal Resilience			
GEN 314 – Encourages students to understand the power of prayer in their personal lives		**X**	
Intellectual Pursuit			
GEN 314 – Encourages students to Be acquainted with waves and frequencies across the spectrum, especially as they pertain to musical instruments.	**X**		
GEN 314 – Encourages students to understand how sounds are made on various types of instruments.	**X**		
GEN 314 – Encourages students to understand the roles that waves and frequencies play in their everyday lives.		**X**	
Global Engagement			
GEN 314 - Encourages students to consider the developments across time in physics and music from around the world.			**X**
Bold Vision			
GEN 314 – Encourages students to understand that there is always more in God.			**X**