California State University, San Marcos **FORM UDGE-BB (WHITE)**

UPPER DIVISION GENERAL EDUCATION NEW COURSE PROPOSAL
FOR AREA BB – MATHEMATICS/QUANTITATIVE REASONING OR PHYSICAL AND LIFE SCIENCES

Please Read Instructions on Next Page of This Form

Course Number __PHYS 357_____ Course Title__The Science of Speech and Hearing_____

o This is a new course. A FORM C is being filed concurrently.

▌ This is an existing course not currently satisfying an UDGE requirement, which is not being changed.

o This is an existing course not currently satisfying an UDGE requirement, which is undergoing change. A FORM C-2 is being filed concurrently.

o This is an existing course currently satisfying an UDGE requirement which is being submitted for recertification. *A FORM C-2 is required only if the course is being changed.*

1. Please attach a syllabus or draft syllabus of the course.

2. How many units is this course? __3__ (Upper-Division General Education courses are limited to 3 units.)

3.a. Does this course have (a) prerequisite (s) other than completion of LDGE requirements?

___yes _X_no

b. Does this course fulfill requirements for a major by the academic unit in which the course is offered? Check the YES box even if the course counts as an elective in the major.

___yes _X_no

c. If you answered "yes" to 3.a. or 3.b., then the course is an exception to the definition printed on the next page of this form, and you must explain why the GE committee should make an exception for this course. Please describe how this course is designed to provide valuable and appropriate learning experiences to both majors and non-majors.

Read Questions 4-7 in the instructions on the next page of this form and submit your answers as attachments. The instructions do not have to be printed or submitted.

Signatures

Originator	Date
Program Director	Date
General Education Coordinator	Date
General Education Committee Chair	Date

FORM INSTRUCTIONS FOR UDGE-BB (WHITE)
UPPER DIVISION GENERAL EDUCATION NEW COURSE PROPOSAL
FOR AREA BB - MATHEMATICS/QUANTITATIVE REASONING OR PHYSICAL AND LIFE SCIENCES

The Definition of Upper Division GE Courses:

Upper Division General Education provides an opportunity for students to learn about areas of study outside their academic major. Upper Division General Education courses assume satisfaction of Lower Division General Education Requirements and develop upper division skills. Courses should not require discipline-specific prerequisites. Designed for non-majors, these courses make explicit the basic assumptions, principles and methods of the disciplinary or interdisciplinary area of study. This conceptual framework and the applicability of these principles and methods should be emphasized throughout the course.

Upper Division General Education courses should help students see how disciplines, ideas, issues and knowledge are often interrelated, intersecting and interconnected. Upper Division General Education courses should present knowledge which can enhance students' lives outside the classroom or their studies in other subjects. These courses should also provide students with a classroom environment that fosters independent, active, engaged learning and a genuine curiosity about the subject matter.

Upper Division General Education courses shall be three-unit courses so that three such courses will exactly correspond with the 9-unit Upper Division General Education requirement of the CSU.

Attachments and responses for questions 1-4 will help the General Education Committee decide if the course is truly suitable to the General Education student. Please read the definition of Upper Division General Education printed above before answering these questions.

1. Please attach a syllabus or draft syllabus of the course.
   See attached.

2. How many units is this course? Upper-Division General Education Courses are limited to (3) units. **3 units**

3. a. Does this course have (a) prerequisite (s) other than completion of LDGE requirements? **No.**

   b. Does this course fulfill requirements for a major by the academic unit in which the course is offered? Check the YES box even if the course counts as an elective in the major. **No.**

   c. If you answered "yes" to 3.a. or 3.b., then the course is an exception to the definition printed above, and you must explain why the GE committee should make an exception for this course. Please describe how this course is designed to provide valuable and appropriate learning experiences to both majors and non-majors.

4. Upper division general-education students may have fulfilled their lower division area B requirements in broad, interdisciplinary courses or in a different discipline than the discipline in which this course is offered. Please explain how this course introduces such students to the basic assumptions, principles and methods of the discipline, and how connection is made between these fundamentals and the particular applications emphasized in the course.

   Speech and hearing are omnipresent processes fundamental to most people's daily lives, and the course is designed such that every CSUSM student from any academic discipline can succeed. This course examines the underlying physics behind these processes and how the same physical principles can be applied to the world around us. Students develop models – graphical, mathematical, pictorial -- to describe sound and hearing in terms of energy principles and wave phenomena. This understanding can be applied to sound, light, and mechanical waves. The course also covers interdisciplinary aspects between physics and speech-language pathology, especially in terms of how human anatomy contributes to the filtering of frequencies in the formation of language. Students will also be introduced to the concepts behind the electronic instrumentation used to diagnose speech; these concepts are broadly applicable to all the electronics in their daily lives.

Criteria for Upper Division Area BB Courses: Questions 5-7 will help the General Education Committee decide if the course belongs in the Mathematics/Quantitative Reasoning or Physical and Life Sciences category.

Address the criteria implied by the following instructions. (In the following instructions, "scientific" or "science" is meant to pertain to the natural, as opposed to social, sciences). "Mathematical" or "mathematics" is meant to include fundamental studies of quantitative, geometrical, statistical and computational methods, and not merely their application to particular problems. Courses in this area include inquiry into the physical universe and its life forms and into mathematical concepts and quantitative reasoning and their applications.

5. Please specify how the course requires students to use reasoning skills characteristic of common scientific and mathematical practice to do one or more of the following: to solve problems, to interpret observations, to make predictions, to design experiments for the testing of hypotheses, or to prove theorems. Examples given should illustrate how these skills are used throughout the course.

   Students must use high school level algebraic skills to quantitatively characterize wave behavior. The first class focuses on a review of the high school mathematics of solving for variables in an equation and calculating mathematical expressions. This is primarily the mode of application for the pr In addition, students will be taught the meaning of sines and cosines in relation to wave behavior~~, and they will be introduced to the logarithmic scale in the study of auditory volume in decibels~~. Although these trigonometric principles are considered to be advanced, the intent is that students obtain a conceptual appreciation of these principles in how they are used to model wave phenomena rather than demonstrate mastery in applying them. The students will also be introduced to the logarithmic scale in the study of auditory volume in decibels. Any mathematical problems involving auditory volume will be restricted to solving one formula to which the solution can only be obtained one way, which can be taught via rote drilling. Other simple algebraic ~~C~~calculations include determining wavelength, frequency, and interference conditions. One relevant assignment is the study of a sound spectrogram that students perform using software such as Praat. Students also

perform basic calculations of the wattage, current, and voltage for simple circuits and their home electronics, since it relates to the understanding of speech diagnostic equipment. Students are also asked to make predictions of physical situations, such as how the air speed through the mouth changes as the lips are opened and closed.

6. Please specify how both past successes and current uncertainties in science or mathematics are well represented in the course, in order that the cumulative, historical nature of the development of science and mathematics can be illustrated. Give examples covered in the course of (a) older, well-established laws and theories that are no longer debated in scientific and mathematical circles, and (b) issues where either fundamental questions remain unanswered or where the application of well-established principles to new situations carries some uncertainty or controversy.

   The mathematics used in the course are high school level arithmetic and algebra, and students will be introduced to sines, cosines, and logarithms from a conceptual standpoint. These are well established mathematical principles. The physical properties of sound waves have also been long established and have been verified in the properties of light, sound, and other mechanical waves. These properties include reflection, refraction, diffraction, and superposition. The more recent science that is still being researched relates to the human formation of sound. Linear source-filter theory of speech production has been established since the 1940's, but nonlinear source-filter phenomena continue to be investigated. Examples of nonlinear phenomena in speech include the bifurcation of frequencies, subharmonic frequencies below the base glottal frequency, and broad non-harmonic spectra. Nonlinear source-filter phenomena can be taught to students via visual graphical representations rather than deriving the complex mathematics. Also, the instrumentation of speech diagnosis continues to be developed as technology advances, e.g., MRI, electropalatography, and X-ray. Exploration of these techniques allows the students to connect modern physics concepts to the more classical concepts of sound and speech production.

Assessment for Upper Division Area BB Courses: Question 7 will help the General Education Committee to evaluate whether you have planned sufficiently for assessing the success of your course.

7. a. Please give examples explaining how the work assigned to students (quizzes, tests, essays, projects, etc.) allows you to measure how successful individual students are in meeting the UDGE learning objectives for this course. Please attach an example of the type of assignment you will use to evaluate how successfully students meet the UDGE learning objectives.

   Students are assessed through their performance of simple calculations and essay responses. Example questions include:

   - **From graphical representations of a wave function, determine the amplitude, wavelength, period, and frequency of the wave.**
   - **Cite three examples of nonlinear source-filter behavior.**
   - **From a graphical representation of a spectrograph, determine the formant frequencies as prescribed by linear source-filter theory.**
   - **How much do you pay the electric company for running your computer for one hour?**
   - **If you extend the length of a vocal tract, how would it change the value of the lowest frequency?**

   Example assignment attached.

   The prevailing teaching philosophy in physics is to train students to extract information from a situation and apply physical concepts in order to solve problems and puzzles.

   b. If you use any course assessment activities (e.g., "pre" and "post" testing, class-wide analysis of individual test questions, etc.) that measure whether or not the class as a whole successfully meets the General Education learning objectives for this course, please attach examples of these as well.

   N/A