College of San Mateo
Official Course Outline

1. **COURSE ID:** MUS. 298 **TITLE:** New Interfaces for Making Music
   Units: 4.0 units **Hours/Semester:** 48.0-54.0 Lecture hours; 48.0-54.0 Lab hours; and 96.0-108.0 Homework hours
   Method of Grading: Grade Option (Letter Grade or Pass/No Pass)
   Recommended Preparation:
   MUS. 290, or ENGR 100

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   Exploration of musical interface design: The use of electronic circuits, sensors, actuators and microprocessors for musical expression; hands-on, project-based, individual and group work. Intended for students who are aspiring musicians, artists, engineers or computer programmers interested in creating new ways to control and manipulate sound.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Critically analyze historic and current digital musical instruments, musical interfaces and interactive computer music systems.
   2. Design and build a new interface for musical expression using current technology.
   3. Create and control sound in an artistic and expressive way using an original digital music interface.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Critically analyze historic and current digital musical instruments, musical interfaces and interactive computer music systems.
   2. Design and build a new interface for musical expression using current technology.
   3. Create and control sound in an artistic and expressive way using an original digital music interface.

6. **COURSE CONTENT:**
   Lecture Content:
   1. Survey of Interfaces for Musical Expression
      A. Traditional Acoustic Instruments
         a. brass and woodwinds
         b. percussion and keyboards
         c. plucked and bowed strings
      B. Analog and Digital Synthesizers and Controllers
         a. keys and pads
         b. knobs and sliders
         c. wheels, pedals, joysticks, ribbon controllers
      C. Experimental Musical Instruments and Interfaces
         a. hand gesture controllers
            i. Theremin
            ii. Sonami Lady's Glove
            iii. Buchla Lightning
         b. light controllers
            i. infrared harp
         c. contact controllers
            i. body percussion
   2. Analysis of Musical Gesture
      A. In Music Performance
         a. acoustic vs. electronic music live performance
         b. artistic expectations of the performer and audience

        c. cultural and artistic meaning
    B. In Sound Art
        a. public as audience and performers
        b. natural phenomena-driven music
        c. environmental sensors and sound
3. Electronic Circuitry in Musical Interface Design
    A. Sensors
        a. photo resistors
        b. audio and ultrasonic sensors,
        c. flex sensors,
        d. pressure sensors,
        e. temperature sensors
    B. Actuators
    C. Misc. Components
        a. potentiometers
        b. push buttons
        c. piezo elements
4. Microcontrollers (Arduino or similar) in Musical Interface Design
    A. Hardware Architecture
    B. Analog and Digital Ins and Outs
    C. Programming, Compiling, Uploading
5. MIDI (Musical Instrument Digital Interface) in Musical Interface Design
    A. MIDI hardware
        a. Ports, cables
    B. MIDI software
        a. MIDI Messages
        b. MIDI programming environments
6. Controlling and Manipulating Elements of Sound
    A. Amplitude
    B. Frequency
    C. Timbre
7. Controlling and Manipulating Elements of Music
    A. Rhythm
    B. Melody
    C. Dynamics
    D. Tempo
8. Final Project Development
    A. Design concept
    B. Creating a proposal
    C. Milestones and time management
    D. Final presentation and -demonstration

Lab Content:

Lab work consists of designing, building and experimenting with new interfaces for music making. Lab projects will gradually increase in complexity, slowly building the skills needed to create an original musical interface.

1. Introductory Musical Interface Projects (3-4 weeks)
    A. Piezo Microphones and Sensors
        a. audio exploration
        b. trigger sensor experimentation
    B. Variations on the Makey Makey Banana Keyboard
        a. computer-human Interface demonstration
        b. introduction to circuits
2. Microprocessor Sensors and Actuator Projects (4-5 weeks)
    A. sensor control of sound elements
    B. sensor control of musical elements
    C. computer-driven actuators for music
3. New Interface for Music Making Final Project (7-8 weeks)
    A. Original interface project using multiple sensors, MIDI, a microprocessor and physical gestural control to artistically control sound and music.

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**
Typical methods of instruction may include:
   A. Lecture
   B. Lab
   C. Activity
   D. Critique
   E. Discussion
   F. Experiments
   G. Observation and Demonstration

8. **REPRESENTATIVE ASSIGNMENTS**
Representative assignments in this course may include, but are not limited to the following:
Writing Assignments:
   Paper on an electronic music artist or instrument inventor incorporating new musical interfaces in their work
   Written project proposal including timelines and milestones
   Written project reports describing the conceptual ideas and techniques used

Reading Assignments:
   Essays and articles written by sound artists, electronic musicians, engineers or computer programmers about the field of musical interface design
   Textbook Chapters
   Manual excerpts
Other Outside Assignments:
   Lab Assignments
   Creative Group and Individual Projects
   Oral Presentation
   Demonstration and Performance Using Final Project

9. **REPRESENTATIVE METHODS OF EVALUATION**
Representative methods of evaluation may include:
   A. Class Participation
   B. Class Performance
   C. Class Work
   D. Exams/Tests
   E. Final Class Performance
   F. Group Projects
   G. Homework
   H. Lab Activities
   I. Oral Presentation
   J. Papers
   K. Projects
   L. Quizzes

10. **REPRESENTATIVE TEXT(S):**
Possible textbooks include:
   A. Edstrom, Brent. *Arduino for Musicians: A Complete Guide to Arduino and Teensy Microcontrollers*, 1 ed. Oxford University Press, 2016
   B. Cook, Mike. *Arduino Music and Audio Projects*, 1 ed. Apress, 2015
   C. Rolf Inge Godøy, Marc Leman. *Musical Gestures Sound, Movement, and Meaning*, 1 ed. Routledge, 2009
Other:
   A. SparkFun Inventor's Kit

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Course Originator: Christine Bobrowski