

KCC STEM Guitar class:

KCC's STEM Guitar course is a cooperative extension of a NSF/ATE-funded project at Sinclair Community College near Dayton, Ohio. Presently, KCC is using an existing "Special Projects" course (ELTR2182) as the venue for STEM Guitar, making it a legitimate Technical Elective for our program's students.



The STEM Guitar concept is an innovative approach to Constructivist training and kinesthetic learning using the hands-on fabrication of a solid-body electric guitar to teach and/or reinforce relevant STEM concepts. In addition, the nature of this course stimulates creativity, critical thinking, problem solving skills, and planning skills – pursuing 3-D design of headstock and body shapes while recognizing the limits needed to maintain technical functionality of the guitar; “Oh, no! I drilled a hole in the wrong place!” can lead to strategic problem solving; “The primer I sprayed on my guitar body needs to dry for an hour!” can lead to planning parallel operations that are not necessarily sequential; etc.



A few examples of the STEM topics covered in this course include:

- ❖ Day-one includes an in-depth discussion of the Fibonacci series, its relation to the so-called “Golden Mean,” and its manifestation in the natural world, as well as classical art and architecture. This leads to the students employing the Golden Mean in the physical shaping of their guitar body and headstock.
- ❖ Math concepts are also taught and used: for calculating the spacing between the frets; for understanding frequency, harmonics, octaves, and guitar intonation.
- ❖ For intonation, students are also taught how to use an oscilloscope and how to set up a band-pass filter between the guitar and the scope.
- ❖ Strength-of-materials and stresses are studied when building the neck, incorporating an adjustable steel truss rod.
- ❖ Students also learn how to read electronic schematic drawings, translate a schematic drawing into a pictorial wiring diagram, and then manifest a functional electronic circuit as they solder together all the electronic components that go into an electric guitar.

At the end of the semester, each student who successfully builds a guitar takes that guitar home with them. They will certainly show off their hand-made guitars giving us the best course promotion we could ask for.



Professor Tim Wilhelm attended an instructor's training course developed by Sinclair Community College and funded through a National Science Foundation NSF project. This project is designed to help faculty increase their students' interest and engagement in the study of and learning of STEM principles, practices, and careers through guitar design and building. Professor Wilhelm quickly adopted the curriculum for KCC and is currently teaching the course with a waiting list.

The National STEM Guitar Project, in partnership with NSF Advanced Technological Education (ATE) Centers with funding provided through a grant from The National Science Foundation (#1304405), hosts innovative Guitar Building Institutes around the United States. The 5-day institutes, combined with additional instructional activities comprising 80 hours, provide faculty training on science, technology, engineering and math (STEM) for middle, high school, and post-secondary faculty. The institutes present and teach participants hands-on, applied learning techniques to help engage students and spark excitement for learning STEM subject matter.

The training course provided STEM educators, like Professor Tim Wilhelm at Kankakee Community College access to the project's STEM curriculum, which are aligned to the Common Core and Next Gen Science standards using guitar building concepts. The curriculum materials are self-contained including instructor resources, training videos, online quizzes/assessments and other valuable references. Participants leave this weeklong experience with their custom-made guitars, curriculum modules with short term assessments that can be immediately integrated into the faculty team school curriculum.

For more information, go to <http://www.guitarbuilding.org/>