Mathematical Approaches to Music

Professor Julian Hook (jubook@indiana.edu)
Tuesday and Thursday, 11:15 a.m.–12:30 p.m.
Simon Music Center, room 340
3 credits

Since the time of Pythagoras it has been recognized that mathematical relationships underlie many musical phenomena, but the precise nature of these relationships remains elusive to this day. Scholars in the Middle Ages grouped music together with arithmetic, geometry, and astronomy in the *quadrivium*, the higher division of the Seven Liberal Arts. More recent generations of music theorists have tried to codify music according to mathematical rules, sometimes applying sophisticated mathematical techniques, with varying degrees of success.

This course will survey some of these mathematical approaches to music, both historical and contemporary. Specific topics to be studied include Pythagorean music and mathematics; Johannes Kepler and the “music of the spheres”; selected topics in acoustics, scale construction, and tunings; geometric representations of musical phenomena; group theory and its applications to pitch-class set theory and twelve-tone theory; and a brief introduction to recent research in musical transformation theory and diatonic set theory.

Course requirements will include regular attendance and participation, assigned readings, several short homework assignments, one major paper, and a class presentation. The paper and presentation will give students an opportunity to explore topics of their own choosing, depending on individual interests and backgrounds.

Prerequisites: Knowledge of pre-calculus mathematics and junior standing, or consent of instructor. Non-music majors with some knowledge of basic music theory are welcome. Students in the Jacobs School of Music Honors Program may register for the course as N399; others may register for T410.