

# PY.550 (RECORDING ARTS AND SCIENCES)

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## **PY.550.111. Recording 1 - Fundamentals A. 2 Credits.**

A course designed to introduce the beginning Recording Arts student to components of the recording process, including a detailed analysis of the nature of sound and human perception, digital audio and operation of recording consoles, microphone types and techniques, editing, and other skills. Open to majors and other majors with permission of instructor.

## **PY.550.112. Recording 1 - Fundamentals B. 2 Credits.**

A course designed to introduce the beginning Recording Arts student to components of the recording process, a detailed analysis of the nature of sound and human perception, digital audio and operation of recording consoles, microphone types and techniques, editing, and other skills. Open to majors and other majors with permission of instructor.

**Prerequisite(s):** PY.550.111[C]

## **PY.550.211. Recording 2 - Studio Technology A. 2 Credits.**

A continuation of Recording I that provides students with an in-depth exploration of the tools and technology associated with the recording process including signal flow, analog and digital theory, signal processing, and recording systems. Open to majors and other majors with permission of instructor

## **PY.550.212. Recording 2 - Studio Technology B. 2 Credits.**

A continuation of Recording I that provides students with an in-depth exploration of the tools and technology associated with the recording process including signal flow, analog and digital theory, signal processing, and recording systems. Open to majors and other majors with permission of instructor. Prerequisite: Recording I.

**Prerequisite(s):** PY.550.211[C]

## **PY.550.311. Recording 3a - Classical/Jazz Techniques. 2 Credits.**

Building on the Recording I and II courses, students will explore techniques for recording in the "tonmeister" style of engineering, particularly as it relates to microphone techniques for classical and jazz music recording, mixing and editing. Additional topics include surround sound and multitrack production. Open to majors only.

## **PY.550.312. Recording 3b - Classical/Jazz Mixing and Editing. 2 Credits.**

Building on the Recording I and II courses, students will explore techniques for recording in the "tonmeister" style of engineering, particularly as it relates to microphone techniques for classical and jazz music recording, mixing and editing. Additional topics include surround sound and multitrack production.

**Prerequisite(s):** PY.550.311[C]

## **PY.550.411. Recording 4a - Rock/Pop Techniques. 3 Credits.**

A continuation of Recording III, this course focuses on contemporary recording techniques associated with rock/pop music production. Topics include multi-track recording, mixing, overdubbing, and headphone monitoring. Open to majors only.

## **PY.550.412. Recording 4b - Rock/Pop Mixing and Editing. 3 Credits.**

A continuation of Recording III, this course focuses on contemporary recording techniques associated with rock music production. Topics include multi-track recording, mixing, over-dubbing, and headphone monitoring. Prerequisite: Recording III or permission of instructor.

**Prerequisite(s):** PY.550.411[C]

## **PY.550.419. Recording Internship. 4 Credits.**

Undergraduate students work in supervised professional positions in which they will have the opportunity to apply the knowledge and expertise developed during their course of study. The internship requires 320 hours of service in an approved facility. Open to majors only.

## **PY.550.511. Advanced Recording Systems 1. 3 Credits.**

Theory and practical application of the tools and techniques used in professional audio recording in all common musical styles. Topics include a review of studio acoustics, human perception of sound, microphone theory and application, signal processing, recording, mixing and mastering. Advanced techniques in Classical, Jazz and Rock music recording, and other styles as time permits. Open to incoming students in the Recording and Production track of the Master of Arts in Audio Sciences program.

## **PY.550.512. Advanced Recording Systems 2. 3 Credits.**

Theory and practical application of the tools and techniques used in professional audio recording in all common musical styles. Topics include a review of studio acoustics, human perception of sound, microphone theory and application, signal processing, recording, mixing and mastering. Advanced techniques in classical, jazz and rock music recording, and other styles as time permits. Prerequisite: Acceptance to Recording and Production track of the Master of Arts in Audio Sciences program, or permission of instructor.

## **PY.550.513. Advanced Studio Production 1. 3 Credits.**

Advanced practical training in producing and engineering recordings in a variety of musical styles at a professional level in a masterclass-like environment with an accomplished professional recording engineer. Final capstone projects will be evaluated by a panel of outside producers representing Classical, Jazz and Rock music styles and engineers who are experts in their respective field of professional audio recording, and presented at the end of the year in an open forum attended by all students in the Recording Arts and Sciences department. Open to majors only.

## **PY.550.514. Advanced Studio Production 2. 3 Credits.**

Advanced practical training in producing and engineering recordings in a variety of musical styles at a professional level in a masterclass-like environment with an accomplished professional recording engineer. Final capstone projects will be evaluated by a panel of outside producers representing Classical, Jazz and Rock music styles and engineers who are experts in their respective field of professional audio recording, and presented at the end of the year in an open forum attended by all students in the Recording Arts and Sciences department. Prerequisite: Recording IV or Advanced Recording Systems.

**Prerequisite(s):** PY.550.513[C]

## **PY.550.515. Musical Acoustics. 3 Credits.**

A course concerned with the physics of sound as applied to properties of musical instruments, perception of musical sound, electronic music reproduction, and the spaces in which they perform. Prerequisites for recording arts majors: Basic Recording I and II or equivalent. Prerequisite for non-recording majors: Basic Recording Techniques or equivalent. Open to majors only, others by permission of instructor.

## **PY.550.516. Electroacoustics. 3 Credits.**

This course focuses on the basics of electroacoustical principles relating to microphones and loudspeakers. Topics include general transducer theory, microphone fundamentals, dynamic and condenser microphones, proximity effect, dynamic cone loudspeakers, closed and vented enclosures, Thiele Small parameters, compression drivers and coaxial loudspeakers, horn loudspeaker theory, and crossover networks. Prerequisites: Musical Acoustics or Audio Design. Open to majors only.

**PY.550.517. Psychoacoustics. 3 Credits.**

The course focuses on the basics of the physiological and psychological aspects of hearing with applications to audio and sound systems, architectural acoustics, and musical acoustics. Topics include auditory physiology of the outer and inner ear, masking, critical bands, loudness, duration, binaural hearing, localization, and pitch. Open to majors only.

**PY.550.519. Acoustics/Audio Measure. 3 Credits.**

The theory and application of objective acoustical and audio measurements are studied. Measurement techniques used in the evaluation of both physical spaces and electronic equipment are presented. Topics include measurement microphones, sound level meters, noise sources, spectrum and FFT analysis, frequency analysis, reverberation, speech intelligibility, transfer functions, swept sine techniques, audio power measurements, ADC and DAC linearity, harmonic distortion and mixed signal testing.

**Prerequisite(s):** PY.550.624[C]

**PY.550.521. Recording Practicum. 4 Credits.**

This is a required course for students pursuing the double-degree program in Recording Arts and Sciences. Throughout the four successive semesters that make up the course, students will assume the role of principle engineer on outside-of-class recordings including classical large and chamber ensembles, a jazz combo and large jazz ensemble, and a studio recording session involving two or more instruments. Students will meet as a group twice per semester to critique work that has been completed.

**PY.550.524. Sound Design/Video Games. 3 Credits.**

This course is designed for advanced Composition, Computer Music, and Recording Arts students to study and collaborate on sound design and composition for video games. The class population is made up of 50/50 composers and recording engineers for the purposes of project collaboration. Enrollment by permission of the chair of the department.

**PY.550.610. Audio Science and Technology. 3 Credits.**

This course is designed to integrate many of the audio and acoustics concepts discussed in the Master of Arts: Concentration in Recording and Production degree curriculum into an exploration of the electronics and acoustics fundamental to audio engineering. Topics include Current, Voltage, and Power in Audio systems; Reactive Circuit Elements; AC Circuits; Semiconductor Devices; Integrated Circuits; Transistor Based Amplifier Circuits; Power Supply Technology; Embedded Systems, and Audio System Engineering. Additional discussion of Architectural Acoustic Fundamentals, including Large Hall and Small room acoustical design. Co- and Pre-requisites: Introduction to Electrical and Computer Engineering (undergraduate) and Advanced Recording Systems (graduate), or permission of the instructor.

**PY.550.611. Music & Technology. 3 Credits.**

An introduction to the world of consumer audio electronics. The playback chain: What it is, how it works, and how it sounds. Lectures and outside-of-class projects will include a topology analysis of and critical listening to the following audio components and technologies: preamplifiers; power amplifiers; loudspeakers; disc players; DACs; music servers; computer audio; turntables, cartridges, tonearms, phono preamplifiers for vinyl disc playback; broadcast and internet radio; home theater configuration; interconnects; receivers; lossy and lossless codecs; multichannel audio and bass management; specifications and measurement; wireless audio profiles and codecs; network audio; active products and DSP; and headphones and headphone amplifiers. At the end of the course students will have a deep understanding of these topics and the ability to aurally discern the musical impact various design topologies have on the playback of recorded sound. Co- and Pre-requisites: Recording III (undergraduate) and Advanced Recording Systems (graduate), or permission of the instructor.

**PY.550.623. Physical Acoustics. 3 Credits.**

Basic fundamentals of physical acoustics involving the generation and propagation of sound. Topics include: fundamentals of vibration; 1, 2, and 3 dimensional vibrations; reflection and transmission; radiation and reception; absorption and attenuation of sound; cavities and waveguides; and pipes, resonators, and filters. Prerequisites: Musical Acoustics, Psychoacoustics, Calculus II, and Physics II

**PY.550.624. Architectural Acoustics 1. 3 Credits.**

This class covers the fundamentals of architectural acoustics design. Topics will include: Plane and spherical waves; acoustic impedance and sound energy density; reflection, refraction, and diffusion; sound absorption; acoustic materials; psychoacoustic aspects; room modes; statistical versus geometric acoustics; reverberation theory; coupled-space acoustics; behavior of sound in rooms; and large versus small room acoustics. Open to students in the Acoustical Studies track of the Master of Arts in Audio Sciences program or by permission of instructor.

**PY.550.625. Audiovisual System Design. 3 Credits.**

The objective of this class is to provide students with an overview of commercial audiovisual systems design. This will include both the considerations required to design audiovisual systems and all the ancillary considerations required to properly integrate these systems with architecture, electrical, mechanical, structural, and IT systems.

**PY.550.626. Noise Control. 2 Credits.**

A continuation of Architectural Acoustics (550 • 624) Topics will include: perceptual aspects of noise control; sound power, noise control criteria and standards; hearing loss prevention; environmental acoustics; airborne sound isolation (transmission loss theory, walls, floors, doors, and windows) structure-borne sound insulation (impact insulation theory and floors); vibration isolation (vibration isolators and design); heating, ventilation, and air conditioning (HVAC) noise control; and noise control applications in buildings. Prerequisites: Physical Acoustics, Architectural Acoustics, or permission of instructor.

**Prerequisite(s):** PY.550.517[C]

**PY.550.627. Acoustical Modeling. 2 Credits.**

Basics of computer modeling for room acoustics and sound system design. Topics include general theory and assumptions underlying computer modeling, different types of acoustical models, auralization, small room acoustics, large room acoustics, and sound system computer models. Introduction to popular computer models including Room Sizer, Room Optimizer, EASE, ULYSSES, and ODEON.

**PY.550.631. Graduate Acoustics Seminar. 2 Credits.**

This course examines professional practices common in the industry, including interaction with clients, design professionals, and contractors; professional ethics and liability; insurance; contracts and fees; and setting and project documentation. Open to majors only.

**PY.550.632. Architectural Acoustics 2. 3 Credits.**

This class is a continuation of content introduced in PY.550.624:

Architectural Acoustics. This course focuses on analysis, design and application, expanding on established foundations and topical content in previous courses. Architectural acoustics applications for Concert Halls, Recital Halls, Spoken-word Theatre Spaces, Lecture and Classroom Spaces, Worship Spaces, Outdoor Performance Venues, Rehearsal and Practice Spaces, Recording and Production Spaces, Cinemas, Sports Venues, Restaurants and/or Office Spaces may be considered. This course is open to students in the MA in Audio Sciences, Acoustical Studies track, or by permission of instructor.

**PY.550.640. Acoustics Design Practicum. 3 Credits.**

In this course taken in the final semester of study, students act as acoustical consultants to design or analyze an existing room or sound system using the knowledge gained through prior classes. The students are responsible for complete analysis, measurements, modeling, design documentation, and presentation of the final design in class. Open to majors only.

**PY.550.651. Recording for Musicians 1. 2 Credits.**

A comprehensive course in recording and associated technologies designed for the musician who wishes to know about the recording arts. The course is taught parallel to Basic Recording I and II but without the required mathematics and physics and is open to upper-level undergraduates and graduate students of all majors.

**PY.550.652. Recording for Musicians 2. 2 Credits.**

Designed for non-recording majors, this class offers an overview of the recording process starting with a basic understanding of the acoustics of a performance space; through the signal chain of microphones, signal processing, recording, editing, mixing, and loudspeaker and headphone monitors; to the acoustics of the monitoring environment and the human perception of sound. Additional topics include mastering a final product and distribution on CD and through online services. The completion of PY.550.651 is a prerequisite.

**Prerequisite(s):** PY.550.651[C]

**PY.550.698. Recording - Ind Study. 1 - 3 Credits.**