UNT® | COLLEGE OF MUSIC

Recording Workshops

May 23-26 and June 13-16, 2022

Welcome

This 4-day workshop is a hands-on learning experience in the recording studio, covering the fundamentals of sound science, digital audio, gear and signal flow, recording, mixing, and mastering for music and media.

Designed and Taught by
Aleyna Brown, Lead Engineer

Assistant Engineers
Seth Blitstein
Phillip Flores

CoM Computer Lab Supervisor
Brennan Pierce

Learn More at lab.music.unt.edu

Overview

Schedule:
Monday - Thursday 10:00am - 4:00pm

Day 1: Principles of Audio & Intro to DAWs
Day 2: Microphones & Recording Techniques
Day 3: Recording Music, ADR, Foley, and more
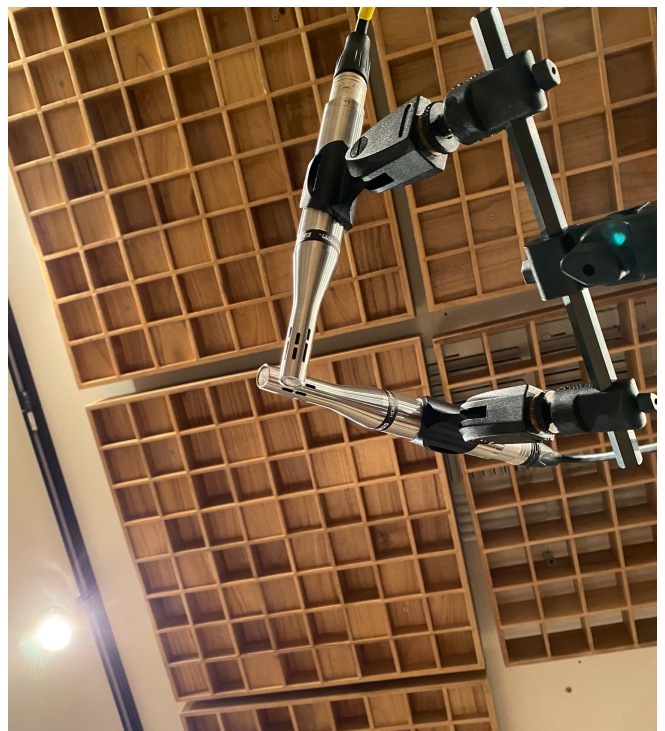Day 4: Editing, Mixing, and Mastering

In this Packet:

Daily Schedule Outline

Day 1: DAW Project Instructions

Glossary of Audio Terminology

Recording Equipment Guide

Additional Resources for Continued
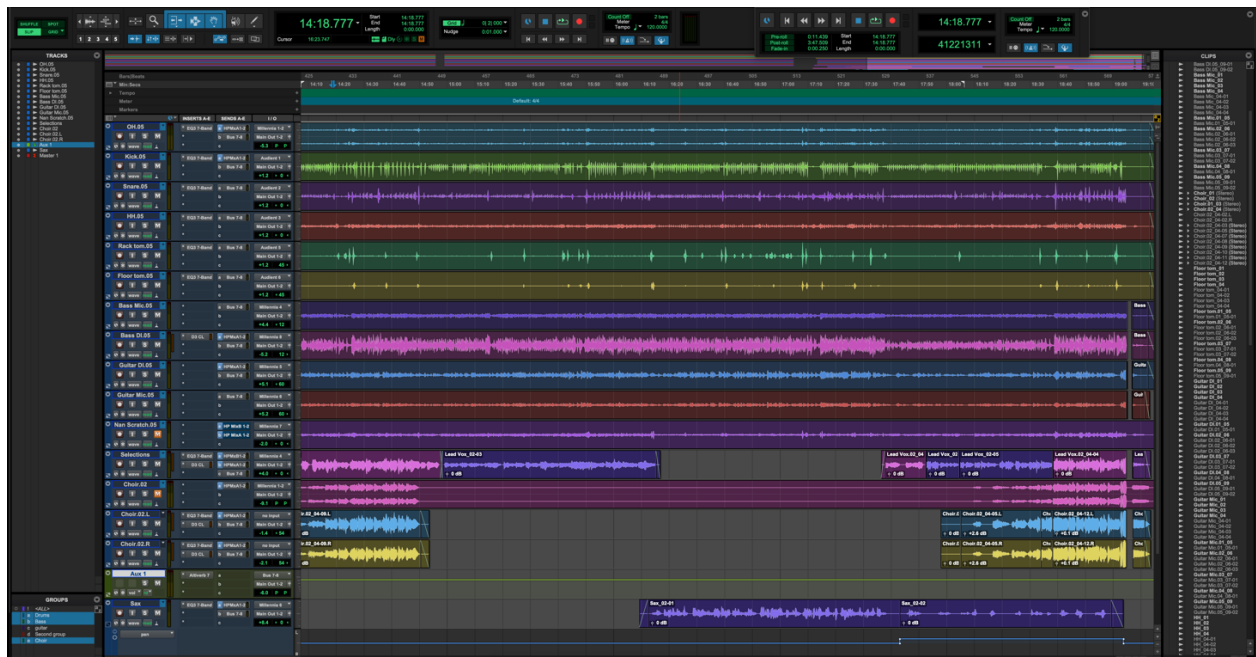Education, Gear, and Recording
Techniques

RECORDING WORKSHOPS
Schedule

Day 1
PRINCIPLES OF AUDIO & INTRODUCTION TO DAW'S

Presentation and discussion on Basics of Sound Science, Principles of Digital Audio, and the Digital Audio Workstation – Pro Tools, followed by a short independent DAW project.

Schedule

10:00-11:00am Workshop Introduction & Basics of Sound Science

11:00-12:00pm Introduction to DAW's – Pro Tools

12:00-1:00pm Lunch Break

1:00-3:00pm Solo/Small Group Independent Project in Media Suite

3:00-4:00pm Share Projects

Day 2
MICROPHONES & BASIC RECORDING TECHNIQUES

Review of signal flow for basic recording setups, equipment for studio/home/live recording, microphone types and techniques, overview of the Lab Studio gear and workflow, followed by hands-on microphone type and placement experimenting.

Schedule

10:00-11:00am Review and Overview of Recording Setup + Equipment

11:00-12:00pm Microphones: Types and Techniques

12:00-1:00pm Lunch Break

1:00-1:30pm Overview of the Lab Studio

1:30-3:30pm In the Studio: Mic Shootout

3:30-4:00pm Debrief & Discuss Day 3 Recording Projects

Day 3
MUSIC, ADR, FOLEY, AND SOUND ART RECORDING

All day hands-on recording in the studio for both small ensemble music groups and foley/sound design/noise art.

Schedule

10:00-10:30am Review and Setup

10:30-12:00pm Small Group 1 Music Recording

12:00-1:00pm Lunch Break

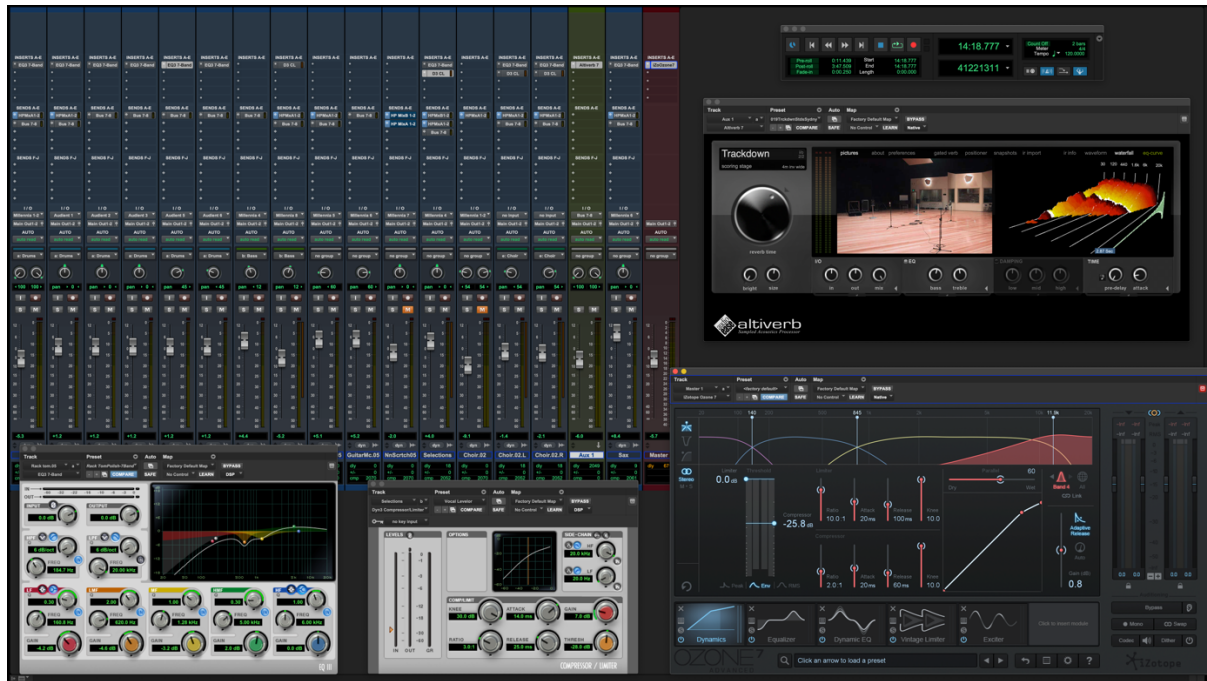1:00-2:45pm Setup Changes and Small Group 2 Music Recording

2:45-3:00 Setup Changes

3:00-4:00pm ADR, Foley, Sound Design & Noise Art Recording

Day 4
POST-PRODUCTION

Editing, mixing, and mastering Day 3's projects in Pro Tools, featuring presentations on panning, EQ, compression, pitch-correction, reverb, FX, limiting, and exporting.

Schedule

10:00-10:30am Review

10:30-12:00pm Editing

12:00-1:00pm Lunch Break

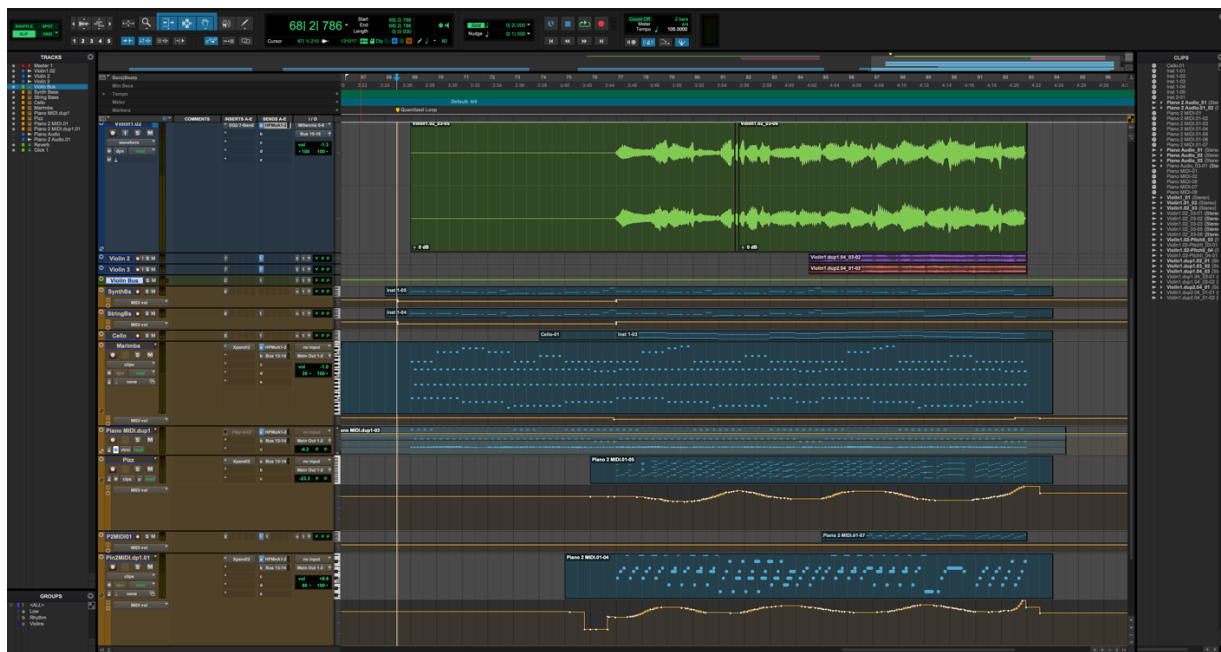1:00-3:00pm Mixing

3:30-3:30 Mastering

3:30-4:00pm Review and Q&A

4

RECORDING WORKSHOP
Day 1: Independent DAW Project

A Unique Composition/Mix in Pro Tools
INSTRUCTIONS

You'll be creating a unique composition/mix using the Digital Audio Workstation Pro Tools* and the provided sound and music libraries

*You can use another DAW of choice if you prefer

Create a sound/music collage (less than 4 min.):

1. Download sounds or music clips from this royalty-free library:
   https://pixabay.com/sound-effects/
2. Import into your Pro Tools session (command-shift-I) or File → Import → Audio
   a. Select "Copy" or "Convert" (if sample rate conversion is necessary)
   b. Add as new tracks or into your clip list

3. Adjust levels of your sounds using the volume faders for each track
4. Arrange together in your own unique composition or collage by dragging clips around the edit window timeline. Remember, you can trim and cut clips as well as fade in/out or crossfade between clips.

(Optional)

5. You can add Instrument tracks
   a. Add a software instrument plug-in like Xpand!2 or Mini Grand as an "Insert" on your Instrument Track
   b. Record Enable
   c. Play in some melodies on the MIDI keyboard
6. You can add automation
   a. Volume, panning, etc.

Project Length: less than 4 min.

GLOSSARY OF FUNDAMENTAL RECORDING TERMS AND CONCEPTS

Basics of Sound

Periodic Wave - a sound wave that oscillates in a regular pattern (sine waves, square waves, sawtooth waves, etc.). We hear periodic waves as pitches
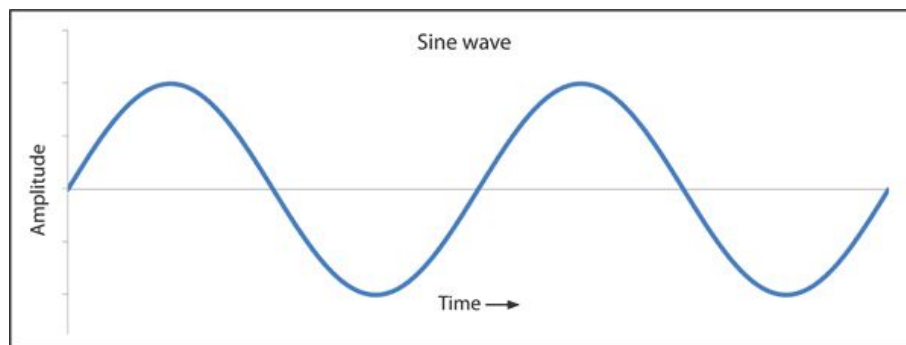
Sine Wave - a periodic wave comprised of only a fundamental frequency

Sawtooth Wave - a periodic wave comprised of a fundamental frequency and all harmonics

Square Wave - a periodic wave comprised of a fundamental frequency and its odd harmonics

Waveform - a visual representation of sound that shows amplitude over time

Ex. 1: Waveform of a sine wave

Amplitude - how powerful a sound is, heard as loudness

Frequency - how often a period of a periodic waveform occurs. The faster a sound oscillates, the higher it will sound in terms of pitch. Frequency is measured in Hertz

Period - the amoung of time it takes for a periodic wave to complete one oscillation

Wavelength - the amount of physical space it takes for a sound wave to complete one period

Location - where a sound emanates from in space

Hertz - how many times per second a sound wave oscillates. Human beings can hear sounds between 20 Hz and 20,000 Hz

Envelope - the contour of a sound's amplitude, defined in terms of attack, sustain, and decay

Attack - the onset of a sound, measured in time

Sustain - a consistent amplitude

Decay - the amount of time it takes for a sound's amplitude to fade from peak amplitude to silence

Phase - a given point in a periodic wave's cycle, measured in degrees

Phasing - the interference or reinforcement of certain frequencies created by two identical sounds starting at different times
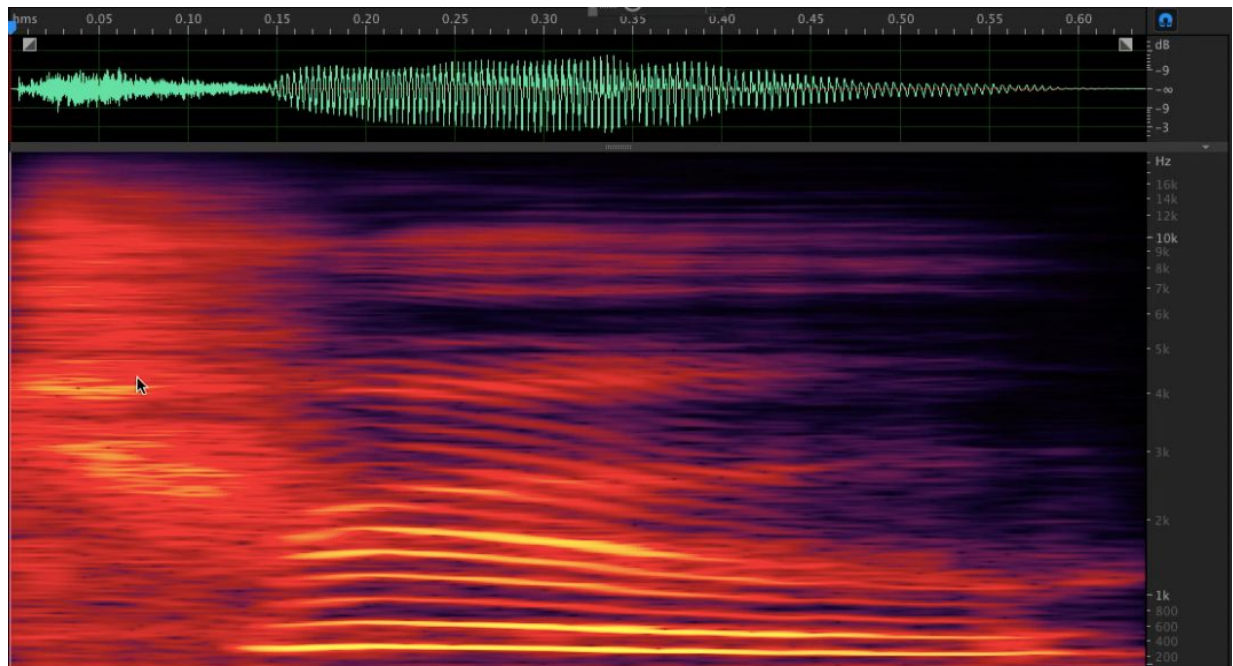
Ex. 2: Three sine waves out of phase with each other
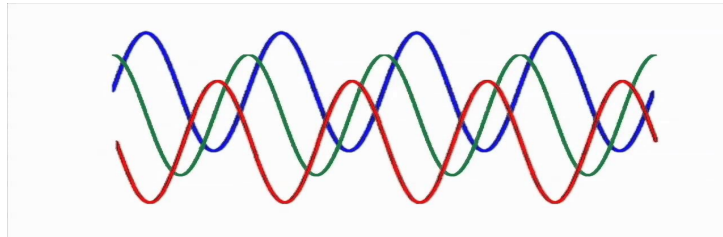
Spectrum - the frequencies that comprise a given sound, heard as timbre

Spectrogram - visual representation of frequency over time, often with color used to represent amplitude

Ex. 3: Spectrogram of the word "True"

Analog and Digital Audio

Transduction - the process by which a signal is converted from one form to another, such as sound pressure to electricity or electricity to digital audio

Transducer - a mechanism that converts a signal from one form to another. Common types include a microphone and a speaker

Analog Audio - when sound is converted from sound pressure to electricity the electric signal is analogous to the sound in the air and is called an analog signal

Digital audio - when an analog signal is converted to digital information by an analog-to-digital converter (ADC)

Analog-to-digital converter (ADC) - an interface that measures an analog signal and converts the signal to digital information so it can be read and manipulated within a computer. The accuracy of measurement is determined by the sampling rate and the bit depth.

Bit depth - the resolution of the measurements taken by the sampling rate. For instance, a bit depth of 16 bits provides 2(16) number of measurements or 65,536 possible amplitude measurements every time a sample is taken. The most common bit depths are 16 or 24 bit

Sampling rate - the number of times per second that an amplitude measurement is taken when converting from analog to digital audio, generally 44.1 kHz or 48 kHz

Ex. 3: Illustration of higher versus lower sampling rates

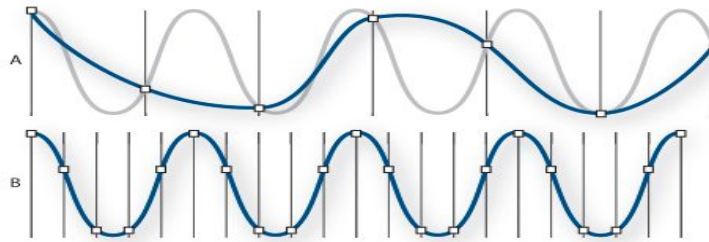Higher sample rate   Lower sample rate
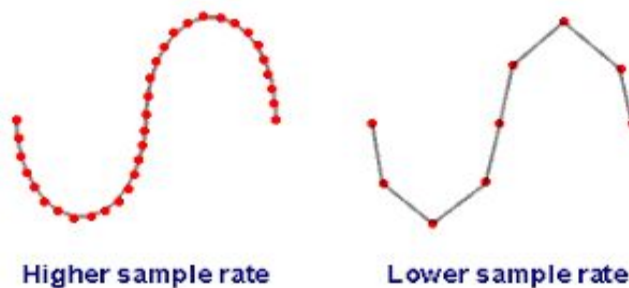
Nyquist frequency - The highest frequency that can be accurately analyzed with a given sample rate. The Nyquist frequency is half the frequency of the sampling rate.

Aliasing - when a given sound is above the Nyquist frequency and is therefore analyzed as a lower frequency than it actually is

Ex. 4: Illustration of aliasing

Decibel (dB) - a logarithmic unit of reference for discussing sound amplitude or volume. There are many different types of decibels and each type is only meaningful in terms of the reference level it refers to

dB SPL - the sound pressure level, describes sound in reference to the sound's audibility and threshold of pain

Ex. 5: Chart illustrating dB SPL levels from inaudibility to the threshold of pain

Source / observing situation	Typical sound pressure level (dB SPL)
Hearing threshold	0 dB
Leaves fluttering	20 dB
Whisper in an ear	30 dB
Normal speech conversation for a participant	60 dB
Cars/vehicles for a close observer	60-100 dB
Airplane taking-off for a close observer	120 dB
Pain threshold	120-140 dB

dBm - describes electrical power in reference to 1 milliwatt, in other words 0 dBM = 1 milliwatt. Has no relationship to voltage or impedance

dBu (also called dBv) - describes an electrical signal in terms of voltage, impedance, and power. 0 dBu = 0.775 volts

dBV - describes an electrical signal in terms of voltage without regard to impedance. 0 dBv = 1 rms without an impedance specification

dBFS (decibels below full scale) - describes the dynamic range below clipping in a digital audio environment. 0 dBFS is the maximum possible level in a digital environment

Miscellaneous Recording Terms

Input level - the level of a signal as it enters a given audio environment

Output level - the level of a signal as it is sent to another point

Preamplifier - a device that applies amplification to a microphone signal prior to recording

Basic Digital Audio Workstation Terms

Digital Audio Workstation (DAW) - A piece of software that allows the user to arrange, edit, synthesize, record, and mix digital audio. Used for recording, mixing, electronic composition, and film scoring. Uses tracks to arrange audio files and other data

MIDI (Musical Instrument Digital Interface) - a type of data that is used to control digital instruments. Does not contain any audio information itself, but is primarily used to tell a given instrument when to play a note, what note to play, when to stop playing a note, and at what dynamic level the note should be played. MIDI contains a variety of other messages, but these are the primary messages

Audio Track - a type of track in a DAW that holds audio files. Can be used to record, edit, and arrange various audio files

MIDI Track - a type of track in a DAW that is used to receive, edit, and send MIDI data. Does not contain any audio information

Instrument Track - a type of track in a DAW that can hold an editable MIDI file and a virtual instrument, allowing the user to edit the MIDI data and hear it back with a chosen virtual instrument

VST (Virtual Studio Technology) - an external piece of software that can be hosted with a DAW. Usually an audio processing effect, a software synthesizer, or an audio analysis tool.

AU (Audio Unit) - a Mac specific equivalent to a VST

Audio Plug-in - General name for any external piece of software used in a DAW, includes VSTs, AUs, RTAS, and AAX

Master Fader - a fader that displays the summed audio signal of every track on a mixer or in a DAW

Basic Equipment for Home Studio Setup

Equipment	Types	Description
Microphone(s)	Many different types	Should be selected based on type of recordings most frequently done
Cable(s)	XLR	3-pin connector carrying a balanced signal, standard microphone cable
	TRS	a 1/4 inch cable, that carries a balanced signal. Has two black bands on the end of the cable
	TS	a 1/4 inch cable that carries an unbalanced signal. Has one black band on the end of the cable
	MIDI	5-pin connector carrying MIDI data not audio. Used for MIDI instruments and interfaces
	TOSLINK	Carries digital audio, either ADAT (8 channels) or S/PDIF (2 channels). Transmits light through the cable
Microphone Stands	Varying heights and weights	A standard 35"-63" stand works well for most applications, but smaller stands for miking kick drum or other instruments
Audio Interface	Often has several features, including mic inputs, line inputs, preamplifiers, an ADC, a DAC, and MIDI connections. Usually connected with USB, Firewire, or Thunderbolt	Many considerations go into selecting an interface, but the most important will likely be the amount of channels you will wish to record simultaneously

Computer	Laptop or desktop can work	Depending on your desired portability
	Mac or PC	Based on user preference
	RAM	At least 4 GB
	Hard Drive Space	At least 15 GB needed for installation
	Processor	At least Intel i5
DAW	Many types such as Reaper, Logic, Cubase, Pro Tools, Digital Performer, Adobe Audition	Generally all DAWs are capable of doing about the same thing in terms of recording, editing, and mixing, but the user interfaces can be quite different. There are also algorithms that may be used for signal processing found in one DAW over another.
Studio monitors	Passive	Need to be powered by a separate amplifier. Advantages of using these include being able to customize the amplification of the speakers, being able to upgrade the quality of the amplifier without upgrading the speaker, and a "cleaner" sound.
	Active	Are powered by internal amplification. Advantages include affordability and simplicity. Ideal for a home studio
Mixing Headphones	Close-backed	These reduce external sound, but have a reduced bass response

	Open-backed	Have a flatter frequency response and increased bass response, but they radiate sound and also do not eliminate external sound

Possible Additional Equipment

Mixer	Good for mixing channels before sending to audio interface for increased tracks, but you will be unable to mix the tracks inside the DAW
DI (direct input) box	For recording guitar and bass directly rather than miking the amp
Control Surface	For mixing with physical faders
MIDI keyboard	For sending MIDI data to your DAW
Subwoofer	For increased low frequency response
Pop Filter	For removing pops when recording vocals
External Preamps	For increasing the quality of recording and adding additional inputs
Stereo Bar	For accurately executing certain stereo microphone configurations

RECORDING WORKSHOPS
Resources

EDUCATION, GEAR, SAMPLES, PLUG-INS, & TIPS

The UNT CoM Lab Studio
Book recording sessions and tutorials, free to students
https://lab.music.unt.edu/studio

Sweetwater InSync
An educational and professional blog on audio gear and techniques
https://www.sweetwater.com/insync/

Sample Libraries
- BBC sound library http://bbcsfx.acropolis.org.uk
- University of Iowa Music Samples http://theremin.music.uiowa.edu/MIS.html
- Converse Sample Library https://www.conversesamplelibrary.com/ Collection of high quality samples, all free
- Freesound https://freesound.org

DAW's
We've used Pro Tools throughout this workshop, but other DAW options may better suit your needs, including Logic or Ableton Live. These do have Student pricing available. If you're not ready to commit, check out Reaper, the free DAW.
- Pro Tools: https://www.avid.com/pro-tools/audio-recording-software
- Logic: https://www.apple.com/logic-pro/
- Ableton Live: https://www.ableton.com/en/shop/live/
- Reaper: https://www.reaper.fm   /

Plug-ins
- Freeverb: http://freeverb3vst.osdn.jp/
- SPAN: http://www.voxengo.com/product/span   / - Audio analyzer
- Dexed: https://asb2m10.github.io/dexed / - DX7 synthesizer emulator
- Surge: https://surge-synthesizer.github.io
- GVST: https://www.gvst.co.uk
- Glitchmachines Free Bundle: https://glitchmachines.com/products/free-bundle/

- Anarchy Rhythms: https://www.anarchy-rhythms.com
- BitKlavier: https://bitklavier.com
- Alter/Ego: https://www.plogue.com/products/alter-ego.html
- Tx16wx http://www.tx16wx.com/ a nice free sampler

Impulse Responses
- Open Air http://www.openairlib.net/
- Echo Thief http://www.echothief.com

Mixing and Production Tutorials
- https://www.youtube.com/user/wickiemedia
- https://www.youtube.com/user/recordingrevolution
- https://www.youtube.com/user/ADSRtuts - production tutorials
- https://www.youtube.com/user/HomeStudioCorner

Other Gear and Recording Techniques
- Home Recording: https://ehomerecordingstudio.com/home-recording-studio-essentials/
- Stereo Pair Techniques: https://www.shure.com/en-US/performance-production/louder/common-techniques-for-stereo-miking
- Avoiding Phasing Problems: https://www.uaudio.com/blog/understanding-audio-phase/

ARTICLES & BUYING GUIDES FOR AUDIO GEAR

Studio Monitors, Speakers, and Headphones
- Studio monitor buying guide https://www.sweetwater.com/insync/studio-monitors-buying-guide/
- Article on what to look for in studio monitors https://www.theproducerschoice.com/blogs/articles/4968492-choosing-studio-monitors -
- Article on speaker specifications http://www.practical-home-theater-guide.com/speaker-specifications.html
- Article headphone specifications http://www.shure.com/americas/support/find-an-answer/understanding-earphoneheadphone-specifications

Understanding Signals and Levels

- Consumer vs. professional line levels and balanced vs. unbalanced signals explained
  https://www.bhphotovideo.com/explora/audio/tips-and-solutions/fun-and-good-hu mored-attempt-demystifying-10-dbv-and-4-dbu
- Mic, instrument, line, and speaker levels explained
  https://www.sweetwater.com/sweetcare/articles/whats-the-difference-between-mic-instrument-line-and-speaker-level-signals/

Audio Interfaces

- Audio interface buying guide https://www.sweetwater.com/insync/audio-interface-buying-guide/

Other Gear

- Cable buying guide https://www.sweetwater.com/insync/cable-buying-guide/

Thank you!

Book Sessions and Tutorials at
lab.music.unt.edu/studio

Contact Us at
music.labrecording@unt.edu