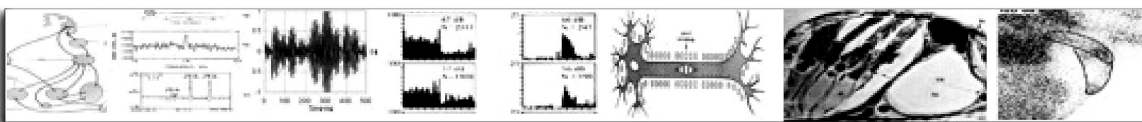


Fundamentals of Sound
RECA 220 – Spring 2026
School of Film & Television, LMU - Pantelis N. Vassilakis Ph.D.



Course #	RECA 220-01 – <i>Pre-requisite to all RECA upper-division courses</i> <i>Grade of “C” or better required to continue as a Recording Arts major</i>
Class Time / Place	Fridays – 11:30 a.m. -2:20 p.m. (3 Units) COMM Arts 105 (<i>study sessions TBD</i>)
Workload	~4.5-6hrs/week (~1.5-2hrs study time per 1hr class time)
Instructor	Pantelis N. Vassilakis , Ph.D. http://acousticslab.org e-mail: panteleimon.vassilakis@lmu.edu - cell: 773-750-4874
TA	Levi Huvard, e-mail: mhuvard@lion.lmu.edu - cell: 805-377-4648
Office hours	By appointment via Zoom or in person (Fridays before/after class)
Tech Support	helpdesk@lmu.edu & https://lmu.service-now.com/servicedesk

COURSE INTRODUCTION

The study of sound is a multidisciplinary field that examines the relationship between the physical world of acoustics and the perceptual world of hearing. More specifically, it examines how sound, as vibration, interacts with sound, as a physiological response, to give rise to sonic sensations/perceptions. A solid grasp of the fundamentals of sound generation, transmission, processing, storage, and perception is essential to students who plan to pursue careers in sound reinforcement, recording, and processing for film, television, multimedia authoring, music, audio arts, and related fields. This course fulfills a requirement for all RECA majors and is a pre-requisite to all upper-division courses in the program (*grade $\geq C$ required*).

COURSE DESCRIPTION AND RATIONALE

From the LMU Catalogue:

“The behavior of sound in various environments and techniques of modifying sound.”

More specifically:

This course provides the necessary foundation for understanding and for creatively and systematically impacting how sound is produced and perceived. It draws from the academic disciplines of physics/acoustics, auditory physiology, and psychology, to examine how the various physical attributes of sound translate into perceptual attributes such as loudness, pitch, and timbre. Topics extend to sound-source localization, speech/music perception, and sonic energy behavior in open and enclosed spaces, exploring relevant case studies to bridge theory and practice.

Hearing is subjective, while most measurements in acoustics are objective, necessitating their clear delineation and a systematic exploration of their relationship. For instance, although a sound level meter may display the same reading for two acoustical signals, listeners might perceive one of them as being much louder than the other. Or, increasing the audibility of a given portion of a signal may be best achieved through a reduction, rather than increase, in its overall level. In addition, divergence in prior experience and listening context contribute to different listeners hearing identical signals differently, a single listener reporting different perceptions for the same signal at different times, *etc.*

LEARNING OUTCOMES

Upon successful completion of the course, students will have demonstrated:

- command of the basic perceptual attributes of auditory sensation and their physical/physiological correlates in terms of
 - pitch, loudness, timbre
 - sensory consonance/dissonance
 - sound-source localization – perception of sound environments – room acoustics
- ability to link sound wave behaviors and complex sonic descriptions to objective quantities in acoustics
- understanding of resonance and how it applies to musical instruments/voice and to listening spaces
- understanding of the impact of sound fundamentals on sonic performance, recording, and mixing practice and other applications in audio and acoustics

TEXT AND MATERIALS

RESOURCES

Course resources, including instructor notes, book chapters, academic and industry articles, and a variety of multimedia demonstrations and interactive animations will be made available via Brightspace <https://brightspace.lmu.edu>

EVALUATION PROCEDURES & GRADING SCALE

ATTENDANCE:	10%
HOMEWORK	45%*
MIDTERM TEST	20%
FINAL EXAM	25%

All assignments and exams will be completed on Brightspace.

Some graded items will include bonus opportunities.

Each class session will address a set of topics and supporting resources. Students are responsible for completing all associated work on time. **To be considered for an extension, students must request it prior to the assignment submission deadline.**

* The lowest-graded homework assignment will be excluded from the homework grade calculation.

GRADING SCALE

94% ≤ A	(superior)	77% ≤ C+ < 80%	(above average)
90% ≤ A- < 94%	(outstanding)	73% ≤ C < 77%	(average)
87% ≤ B+ < 90%	(very good)	69% < C- < 73%	(below average)
83% ≤ B < 87%	(good)	60% < D < 69%	(poor)
80% ≤ B- < 83%	(promising)	F < 60%	(failed)

I: incomplete – assigned in accordance with LMU's academic guidelines

<https://bulletin.lmu.edu/academic-degree-requirements-policies/#:~:text=Incomplete%20Course%20Work>

CLASSROOM POLICIES

- **Monitor your LMU email regularly for reading, class/exam preparation, and assignment instructions.** All class materials will be accessible via Brightspace.
For all technical issues regarding email, Brightspace, etc., **contact the LMU Service Desk** at helpdesk@lmu.edu - 310-338-7777 - 213-736-1097 - Self-service: <https://lmu.service-now.com/servicedesk> - Online Learning Resources: <https://academics.lmu.edu/onlinelearning>
- You are expected to abide by LMU's policies on **academic honesty and integrity**, <http://academics.lmu.edu/honesty>. Violations include but are not limited to cheating, plagiarism, fabrication, falsification or sabotage of research data, destruction or misuse of the College's academic resources, and alteration or falsification of academic records.
Note: You are encouraged to use multiple resources for your assignments, including AI tools. However, copying extended portions of resources or AI responses, verbatim, without attribution, fails to communicate your understanding of the materials, constitutes plagiarism, and will be penalized.
- **Be respectful of all class members. Be prepared to accept and offer criticism, to question and be questioned.** Intellectual disagreements and conflicts that do not involve personal attacks are strongly encouraged. They are necessary in order to formulate strong intellectual argumentation skills and improve understanding. Our course constitutes a safe space for ideas: a space where we can all safely (*i.e.* without fear of any negative consequences) engage in vigorous, rigorous, and challenging, intellectual explorations. As an LMU Lion, by the *Lion's Code*, you are pledged to join the discourse of the academy with honesty of voice and integrity of scholarship and to show respect for staff, professors, and other students.
- **Be ready to begin by the scheduled class start time - Put smartphones away.**
- **Attendance is mandatory. If you cannot make it to a class meeting you must notify me in advance of, or soon after the meeting, via email or phone.** Unapproved absences will be penalized. Special circumstances will be handled on an individual basis.

IMPORTANT DATES – TENTATIVE TOPICS – SCHEDULE OUTLINE

For deadlines to add, drop, or withdraw from courses and for other important dates, select the appropriate semester at <https://registrar.lmu.edu/academicresources/calendars-academic>

Homework assignments and exams will be scheduled and announced in advance via Brightspace and email.

Course Outline (*more details will be posted on Brightspace throughout the semester*)

Module 01	Class introductions/expectations – Syllabus _ <i>Introduction to sound fundamentals – Scope of study</i> _ <i>Sound; Music; Noise: essential & operational definitions</i> _ <i>Basic physical variables and units</i>
Module 02	_ <i>Physical aspects of acoustic waves I:</i> Basic acoustic concepts and measures – Logarithmic scales Sound waves – Inverse square law Linear superposition & interference – Standing waves Spectra – Fourier analysis – Modulation
Module 03	_ <i>Physical aspects of acoustic waves II:</i> Sound wave propagation – Resonance Reflection/Reverberation – Diffraction – Refraction – Absorption _ <i>Musical instruments as sound-wave generators & transmitters</i> _ <i>Signal processing & digital signals</i>
Module 04	_ <i>Biology of hearing – Nonlinearity of the hearing mechanism</i> Review of the auditory system Nonlinear response to frequency and intensity Masking and psychophysical tuning curves
Module 05	_ <i>Perceptual attributes of acoustic waves – Part I: Loudness</i> Intensity discrimination & <i>Just Noticeable Difference</i> (JND) Effects of frequency, spectrum, & duration – Loudness scales Adaptation, Fatigue, & Temporary Threshold Shift (TTS)
Module 06	_ <i>Perceptual attributes of acoustic waves – Part II: Pitch</i> Definitions – Frequency/Pitch ranges – JND for pitch Pitch of pure & complex tones Pitch relations/units – The octave; Multidimensionality of pitch: Pitch height & pitch chroma
Module 07	_ <i>Perceptual attributes of acoustic waves – Part III: Timbre</i> Acoustical & cognitive aspects of timbre Beating & roughness - consonance / dissonance Time and a) pitch, b) loudness, & c) timbre

Module 08

- *Auditory localization: Cues and processes*
 - Interaural time (phase) & level differences
 - Binaural cues and release from masking
 - Interaural spectral differences & HRTFs
 - Cone of confusion* & head movements
 - Judging sound source distance
 - The *precedence* effect

Module 09

- *Sound environment*
 - Small Room Acoustics
 - Perceptual criteria for room acoustics and related acoustic & room construction/layout features

Tentative Nature of the Syllabus: This syllabus and its contents are subject to revision; students must observe any modifications distributed in class or posted on LMU's course management system, Brightspace. Students will be notified of any syllabus revisions in the same manner(s) that the original syllabus was distributed (for example, distributed in class and/or posting on Brightspace) and via all typical class communication channels.

EMERGENCY PREPAREDNESS & COVID19 RESOURCES

To report an emergency or suspicious campus activity, contact the LMU Department of Public Safety by phone (x222 or 310-338-2893) or via the nearest emergency call box. In the event of an evacuation, follow evacuation signage to the designated safe refuge area, where you will receive further instructions by Public Safety staff or a Building Captain. For more safety information and preparedness tips, visit <http://www.lmu.edu/emergency>.

For LMU's Covid19 resources visit <https://www.lmu.edu/together>.

SAFE SPACE IN CREATIVE AND CRITICAL COURSES

Reporting Requirements of Sexual or Interpersonal Misconduct: As “responsible employees,” If a student tells a faculty/staff member that the student has experienced sexual or interpersonal misconduct, recently or in the past faculty/staff are required to report and cannot protect student confidentiality. What this means is that the student will receive the appropriate support. For reference of process please consult these resources: <https://studentaffairs.lmu.edu/about/osccr/studentcodespolicies/>.

If a student is struggling with topics presented in class by the professor or fellow students, they may find information about confidential counseling on campus and for general information about consensual relationships, sexual harassment, and sexual assault, please see the LMU Cares website: <http://studentaffairs.lmu.edu/lmucares>.

Student Self-Care

Please prioritize your self-care. LMU has many health and wellness resources available to support you at every step of your journey.

Learn more at <https://studentaffairs.lmu.edu/lionwellness/>.

SCHOOL OF FILM AND TELEVISION – MANDATORY PARAGRAPHS

Special Accommodations: Students with special needs, who require assistance or accommodations in this course, should promptly direct their request to Disability Support Services (DSS) Office (Daum Hall 2nd floor, 310-338-4216). Any student who currently has a documented disability (ADHD, Autism Spectrum Disorder, Learning, Physical, or Psychiatric) needing academic accommodations should contact the DSS Office as early in the semester as possible. All discussions will remain confidential. Visit www.lmu.edu/dss for additional information.

Safety: The School of Film and Television is fully committed to safety and sensible risk management. Every student is required to adhere to all safety and risk management policies. The School considers violation of the Safety and Risk Management policies infractions of the LMU Student Honor Code. Code is found in the Undergraduate and Graduate Bulletin under Academic Degree Requirements and Policies re: non-academic matters. For non-academic matters, all students are also governed by the Loyola Marymount University Student Conduct Code, found in the Community Standards booklet. The booklet can be found at <https://studentaffairs.lmu.edu/about/osccr/studentcodespolicies>. Policies are also listed in the Production Handbook. In accordance with the Honor Code guidelines and process, disciplinary measures may range from warnings, to failure in the course, to expulsion from the University. Additionally, any footage acquired during the commission of a violation of these policies will be disallowed from projects. Students in violation of SFTV policies also risk suspension of Privileges. Privileges include access to SFTV Production and Post-Production resources, equipment, LMU production insurance and participation in the end-of-semester screenings. When a violation occurs, the Instructor, the appropriate Department Chair, HOPA, and the Graduate Director will meet to determine whether and to what extent the student shall incur temporary loss of privileges, or they may jointly make a recommendation to the Dean for permanent loss of privileges.

SFTV Grading Screenings: The Final Screenings are grading sessions. They are open to and welcome all SFTV students, the entire SFTV community, and invited guests, including key crew and alumni. There will be a special screening for crew members, friends and family at the end of the grading week. The procedures for the Final Screenings will be announced each year, in advance. In accordance with departmental policy, student projects will not be screened past the maximum length specified in the syllabus.

SFTV Policy Statement on Students Not Paying for Work: SFTV encourages the collaboration of students in the production of creative projects, understanding that students with various interests represent different specialized areas of knowledge. Your LMU academic peers should not be charging for their services but, instead, if they volunteer on your project, you should recognize that their contributions are significant and deserving of on-screen credit. You should treat any volunteer respectfully as talent, understanding that contributions from those outside this course enrollment are voluntary and not required.

Academic Honesty: Academic dishonesty will be treated as an extremely serious matter with severe consequences that can range from receiving no credit for assignments/tests, to failing the class, to expulsion. It is never permissible to turn in any work that has not been authorized by the student, such as work that has been copied from another student or copied from a source (including Internet) without proper attribution. Work must meet LMU's Academic Honesty standards: <http://academics.lmu.edu/honesty>

Expectations for Classroom Behavior: Disruptive behavior which is persistent or significantly interferes with classroom activities may be subject to disciplinary action. A student may be referred to the Office of Student Judicial Affairs if their behavior constitutes a violation of the conduct code.

Course Evaluations: Student feedback on this course provides valuable information for continued improvement. All students are expected to fairly and thoroughly complete a course evaluation for this course. All course evaluations for SFTV will be administered online. You will receive an e-mail notification at your Lion e-mail address when the evaluation form is available.