

Title: Aud 822 - Instrumentation

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Course Description

A study of the generation, control, and measurement of simple and complex sounds essential to clinical audiology and hearing research.

Course Objective

1. Review basic mathematics required for instrumentation concepts.
2. Understand simple and complex signals.
3. Introduce linear and nonlinear systems.
4. Introduce the physics of electronic components and provide hands on experience with analog signal generation and analysis equipment.

ASHA Standards

Students enrolled in this class will acquire knowledge and skills associated with the following ASHA standards for certification in Audiology:

- B11. Instrumentation and bioelectric hazards.
- B13. Physical characteristics and measurement of acoustic stimuli.
- B14. Physical characteristics and measurement of electric and other nonacoustic stimuli.
- D17. Use instrumentation according to manufacturers' specifications and recommendations.
- D18. Determine whether instrumentation is in calibration according to accepted standards.

Course Format

Lecture and laboratory. Classes will be Monday and Wednesday afternoons (1:00-2:20). In general, Mondays will be lab days and Wednesdays will be lecture.

Grading Policy

Grades will be based on homework (10, 25 pts each) which will normally be given on Wednesday and due on the following Wednesday, laboratory projects (2, 50 pts each), exams (2, 100 pts each). Total number of points = 550. Grades are assigned as $\geq 492 = A$, $437-491 = B$, $382-436 = C$, $327-381 = D$, $\leq 380 = F$.

Required Reading

1. Rosen, S., & Howell, P. (1991) Signals and Systems for Speech and Hearing. Academic Press: New York
2. Grob, Bernard. (1992). Basic Electronics. McGraw-Hill: New York.

General Course Outline and Readings – 2007

<u>Approx Schedule week</u>	<u>Topic</u>	<u>Readings</u>
1-2	Review: Equations, Variables, Functions, and Graphs (linear, exponential, trigonometric, logarithmic)	
2-3	Sinusoids, Complex signals (square, triangle, click, noise, AM, FM)	S&S - 2, 3
4	Fourier Series dB, dBSPL, dBHL, dBSL Cords and Connectors	S&S -7 S&S - 3
5-6 (Exam) (Lab 1)	Linear Systems (filters: transfer functions, types, gain, phase, slope; Systems (ear canals, hearing aids, headphones) Nonlinear Systems (basilar membrane, distortion products)	S&S - 4,5,6,9,10
7-9	Electronics (physics, circuits and elements, Ohms law, time constants, filters, amplifiers, impedance) Cell circuits, Davis model	Grob
10-12 (Lab 2)	Acoustic Impedance (volumes of air, tympanometry) Acoustics of tubes, resonators Middle Ear Impedance	Katz 11, 12
13-14	Calibration (microphones: types, sensitivity) Calibration (sound level meter: weighting scales, time constants, filters, scales) Audiometer Calibration	SLM manual
15-16 Final Exam	Digital signal processing (A/D, D/A, sampling theory, quantization) Digital signal processing (analysis)	S&S – 14

Learning assistance, academic performance enhancement, and psychological services at KUMC are free, confidential, and available at Student Counseling & Educational Support Services by calling 913-588-6580 or visit G116 Student Center.

Any student in this course who needs an accommodation because of a disability in order to complete this course should contact the instructor the Equal Opportunity/Disability Specialist (913-588-7813, TDD 913-588-7963) as soon as possible.

Any student with extenuating circumstances which could prevent the fullest expression of his/her abilities should contact the instructor to make individual arrangements.

Any student who does not understand and/or accept the contents and terms of this syllabus must notify the instructor in writing within one week after receiving this syllabus.