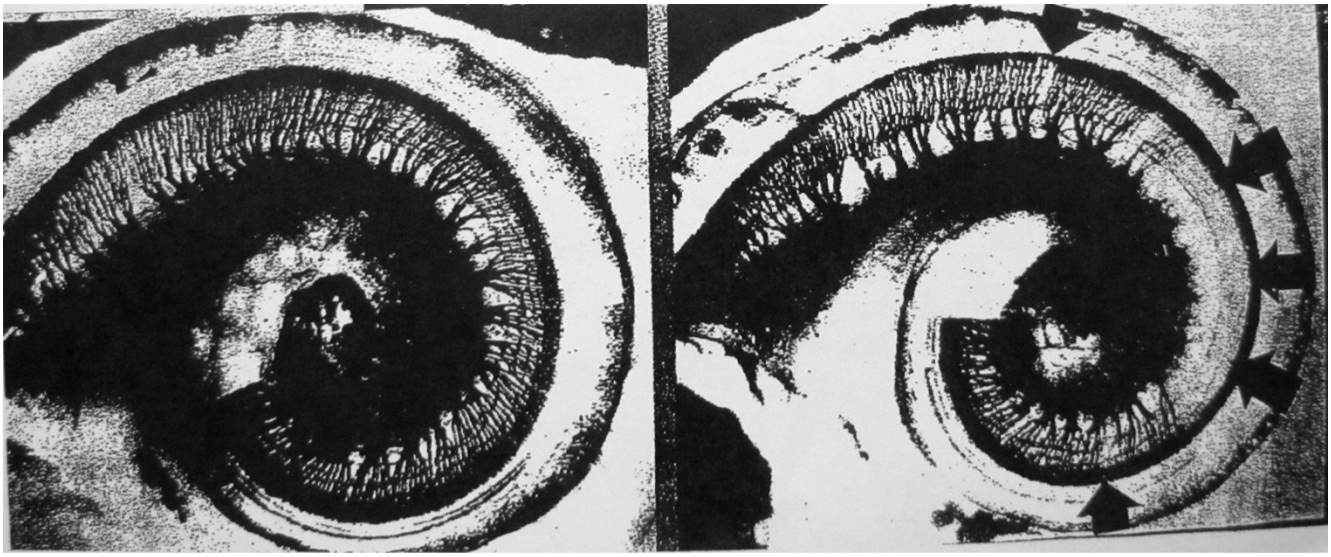
This is your ear ***This is your ear on noise***



HESP 710: INDUSTRIAL AND ENVIRONMENTAL NOISE PROBLEMS
Fall, 2016

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Course Schedule

August 30	Introduction; Class expectations; Public health significance of noise-induced hearing loss Historical outline of hearing conservation and noise control
Readings	1. Nelson et al. (2005). The global burden of occupational noise-induced hearing loss. *Am J Ind Med, 48*, 446-458. 2. Tak, S., Calvert, G. M. (2008). Hearing difficulty attributable to employment by industry and occupation: an analysis of the National Health Interview Survey--United States, 1997 to 2003. *J Occup Environ Med*, 50, 46-56.
September 13	Noise-induced damage to the cochlea *Media topic*
Readings	1. Henderson, D., Bielefeld, E. C., Harris, K. C., et al. (2006). The role of oxidative stress in noise-induced hearing loss. *Ear Hear*, 27, 1-19. 2. Bohne, B. A., Harding, G. W., Lee, S. C. (2007). Death pathways in noise-damaged outer hair cells. *Hear Res*, 223, 61-70. 3. Hill, K., Yuan, H., Wang, X., & Sha, S. H. (2016). Noise-Induced Loss of Hair Cells and Cochlear Synaptopathy Are Mediated by the Activation of AMPK. *J Neurosci*, 36(28), 7497-7510. 4. Kamogashira, T., Fujimoto, C., & Yamasoba, T. (2015). Reactive oxygen species, apoptosis, and mitochondrial dysfunction in hearing loss. *Biomed Res Int*, 2015, 617207.
September 20	Noise-induced damage to the central auditory system Early noise exposure effects and age-related hearing loss *Media topic*
Readings	1. Kujawa, S. G., & Liberman, M. C. (2009). Adding Insult to Injury: Cochlear Nerve Degeneration after "Temporary" Noise-Induced Hearing Loss. *J Neurosci* 29(45), 14077-14085. 2. Kujawa, S. G., & Liberman, M. C. (2006). Acceleration of age-related hearing loss by early noise exposure: evidence of a misspent youth. *J Neurosci, 26*(7), 2115-2123. 3. Pienkowski, M., & Eggermont, J. J. (2009). Long-term, partially-reversible reorganization of frequency tuning in mature cat primary auditory cortex can be induced by passive exposure to moderate-level sounds. *Hear Res*, 257(1-2), 24-40.
September 27	Noise measurement and instrumentation Risk assessment *In-class worksheet* *Demonstration of sound level meter and dosimeter measurements*
Readings	1. Qui, W., Hamernik, R. P., Davis, R. I. (2013). The value of a kurtosis metric in estimating the hazard to hearing of complex industrial noise exposures. J Acoust Soc Am, 133, 2856-2866. 2. Venet, T., Campo, P., Rumeau, C., Thomas, A., & Parietti-Winkler, C. (2014). One-day measurement to assess the auditory risks encountered by noise-exposed workers. Int J Audiol, 53(10), 737-744.
October 4	Noise regulations *In-class worksheet* *Media topic*
Readings	1. NIOSH criteria for a recommended standard 2. MSHA Federal Register 3. Federal Railroad Administration
October 11	Noise control Efficacy of hearing conservation programs

	In-class worksheet Review for midterm
Readings	1. Daniell, W. E., Swan, S. S., McDaniel, M. M., Camp, J. E., Cohen, M. A., & Stebbins, J. G. (2006). Noise exposure and hearing loss prevention programmes after 20 years of regulations in the United States. *Occup Environ Med*, 63(5), 343-351. 2. Fernandez, M. E., Bartholomew, L. K., Alterman, T. (2009). Planning a multilevel intervention to prevent hearing loss among farmworkers and managers: a systematic approach. *J Agric Saf Health*, 15, 49-74. 3. Saunders, G. H., Griest, S. E. (2009). Hearing loss in veterans and the need for hearing loss prevention programs. *Noise Health*, 11, 14-21.
October 18	**MIDTERM** (Take-home exam due 11:59 pm on 10/25/16)
October 25	Noise-induced hearing loss and the military; Blast injury *Media topic* GUEST LECTURER from Walter Reed – LTC Blank
Readings	1. Dougherty, A., MacGregor, A. J., Han, P. P., Viirre, E., Heltemes, K. J., & Galarneau, M. R. (2013). Blast-related ear injuries among U.S. military personnel. *J Rehab Res Dev*, 50(6), 893-904. 2. Gallun, F. J., Lewis, M. S., Folmer, R. L., Diedesch, A. C., Kubli, L. R., McDermott, D. J., Walden, T. C., Fausti, S. A., Lew, H. L., & Leek, M. R. (2012). Implications of blast exposure for central auditory function: A review. *J Rehab Res Dev*, 49(7), 1059-1074. 3. Yong, J. S., & Wang, D. Y. (2015). Impact of noise on hearing in the military. *Mil Med Res*, 2, 6.
November 1	Hearing protective devices and fitting practicum *In-class worksheet*
Readings	1. Abel, S. M., Nakashima, A., & Saunders, D. (2011). Speech understanding in noise with integrated in-ear and muff-style hearing protection systems. *Noise Health, 13*(55), 378-384. 2. Earlogs 1-21
November 8	Synergistic effects of noise and other agents Susceptibility to NIHL *Media topic*
Readings	1. Boettcher, F. A., Henderson, D., Gratton, M. A., Danielson, R. W., & Byrne, C. D. (1987). Synergistic interactions of noise and other ototraumatic agents. *Ear Hear*, 8(4), 192-212. 2. Metwally, F. M., Aziz, H. M., Mahdy-Abdallah, H., ElGelil, K. S., & El-Tahlawy, E. M. (2012). Effect of combined occupational exposure to noise and organic solvents on hearing. *Toxicol Ind Hea*lth, 28(10), 901-907. 3. Sliwinska-Kowalska, M., & Pawelczyk, M. (2013). Contribution of genetic factors to noise-induced hearing loss: a human studies review. Mutat Res, 752(1), 61-65.
November 15	Recreational noise Music-induced hearing loss Noise-induced hearing loss in children *Media topic*
Readings	1. Halevi-Katz, D. N., Yaakobi, E., & Putter-Katz, H. (2015). Exposure to music and noise-induced hearing loss (NIHL) among professional pop/rock/jazz musicians. *Noise Health, 17*(76), 158-164. 2. Schmidt, J. H., Pedersen, E. R., Paarup, H. M., Christensen-Dalsgaard, J., Andersen, T., Poulsen, T., & Baelum, J. (2014). Hearing loss in relation to sound exposure of professional symphony orchestra musicians. *Ear Hear,* 35(4), 448-460. 3. O'Brien, I., Driscoll, T., Williams, W., & Ackermann, B. (2014). A clinical trial of active hearing protection for orchestral musicians. *J Occup Environ Hyg*, 11(7), 450-459.

	4. Stone, M. A., & Moore, B. C. (2014). Amplitude-modulation detection by recreational-noise-exposed humans with near-normal hearing thresholds and its medium-term progression. *Hear Res*, 317, 50-62. 5. Taljaard, D. S., Leishman, N. F., & Eikelboom, R. H. (2013). Personal listening devices and the prevention of noise induced hearing loss in children: the Cheers for Ears Pilot Program. *Noise Health, 15*(65), 261-268
November 22	Hearing critical jobs/ Drafting hearing standards Auditory fitness for duty Audiologists as expert witnesses *Media topic*
	1. Semeraro, H. D., Bevis, Z. L., Rowan, D., van Besouw, R. M., & Allsopp, A. J. (2015). Fit for the frontline? Identification of mission-critical auditory tasks (MCATs) carried out by infantry and combat-support personnel. Noise Health, 17(75), 98-107. 2. Tufts, J. B., Vasil, K. A., & Briggs, S. (2009). Auditory fitness for duty: a review. J Am Acad Audiol, 20(9), 539-557. 3. Ali, S., Morgan, M., & Ali, U. I. (2015). Is it reasonable to use 1 and 8 kHz anchor points in the medico-legal diagnosis and estimation of noise-induced hearing loss? Clin Otolaryngol, 40(3), 255-259.
November 29	Therapeutic agents to prevent NIHL 1. Harris, K. C., Bielefeld, E., Hu, B. H., & Henderson, D. (2006). Increased resistance to free radical damage induced by low-level sound conditioning. *Hear Res*, 213(1-2), 118-129. 2. Claussen, A. D., Fox, D. J., Yu, X. C., Meech, R. P., Verhulst, S. J., Hargrove, T. L., & Campbell, K. C. (2013). D-methionine pre-loading reduces both noise-induced permanent threshold shift and outer hair cell loss in the chinchilla. *Int J Audiol*, 52(12), 801-807. Tanaka, C., Chen, G. D., Hu, B. H., Chi, L. H., Li, M., Zheng, G., et al. (2009). The effects of acoustic environment after traumatic noise exposure on hearing and outer hair cells. Hear Res, 250(1-2), 10-18.
December 6	4. Student presentations
December 13	3. **Take-home final posted**
December 20	**Take-home final submission due date**

Grading System

Summary of point system:

In-class worksheets: 10 points each	4 worksheets x 10 pts = 40
Media presentation: 20 points each	1 presentation x 25 pts = 20
Research paper/Project: 50 points each	1 project x 50 pts = 50
Noise survey: 50 points each	1 project x 50 pts = 50
Midterm: 120 points	1 exam = 120
Final: 120 points	1 final = 120
	400

University of Maryland Grade Policy

Course Average	Course Grade

93 – 100	A
90 - 92	A-
87 - 89	B+
83 - 86	B
80 - 82	B-

LEARNER OUTCOMES

Students will acquire knowledge in noise control, hearing conservation, industrial audiology, occupational audiology, and fitness-for-duty evaluation.
As a result of knowledge obtained in this course, students will be able to:

1. Provide a historical outline of industrial audiology, noise control, and hearing conservation program development, including military audiology.
2. Reference the legal basis for hearing conservation and noise control programs.
3. Understand the legal basis for worker's compensation resulting from overexposure to noise.
4. Measure and quantify noise levels and noise dose.
5. Develop and implement an effective hearing conservation program.
6. Select an appropriate hearing protective device, and evaluate effectiveness.
7. Understand how noise interacts with other physical and chemical exposures.
8. Identify, evaluate, and quantify noise effects using audiological test procedures.
9. Recommend noise control strategies and engineering controls.
10. Understand and manage special cases in noise, such as musicians, military members, extreme exposures, and those with special communication needs.
11. Have a working knowledge regarding research in prevention of noise induced hearing loss using pharmaceuticals
12. Evaluate and make recommendations for management of recreational noise.
13. Provide an audiometric fitness-for-duty evaluation.
14. Understand how to develop an audiometric standard based on essential job functions.

Each student's knowledge and skills in these areas will be determined by the following assessment procedures:

1. Written examinations (one mid-term examination and one final examination).
2. Research abstracts/project
3. Noise measurement project
4. Attendance and participation in class and in-class worksheets

Research Paper or Project
Each student must submit a short research paper on a relevant topic of interest. Papers should be 5-10 pages in length, double-spaced, and must be appropriately referenced with at least three peer-reviewed journal articles. In lieu of research paper, you may also opt to submit a relevant project. Be creative! I am open to suggestions. Topic or project must be improved by instructor by 27 SEP 16; paper or other work product must be submitted online by 22 NOV 16.

Research suggestions include, but are not limited to:

Drugs for prevention of NIHL
Temporary threshold shift
Musicians and NIHL
Blast exposure and NIHL
Different effects of continuous/intermittent vs impulse/impact noise exposures
Synergistic effects of industrial toxins and noise
Biochemical changes following noise exposure
Presbycusis and noise-induced hearing loss
Non-auditory effects of noise
Acoustic reflex and noise-induced hearing loss
Ear protectors
Forensic audiology
Conditioning or toughening effects

Project suggestions include, but are not limited to:

Compare different combinations of double protection
Create a business plan for an industrial audiology service
Develop a training video or brochure
Develop a hearing standard for a particular job
Develop a testing protocol for fitness for duty for a particular job
Evaluate a particular product, pros and cons
Review a relevant product liability case
Establish real world NRR's on a particular type of hearing protection
Outline a noise control strategy for a particular industry
Compare and contrast various strategies to establish PAR (Personal Attenuation Rating) or different fit-check systems currently available

Noise Measurement Project

Students are required to select an area or operation and perform a noise survey. Students must measure environmental noise using both a sound level meter and a noise dosimeter. Use the sound level meter to establish hazard radius; use the dosimeter to determine dose and whether or not the exposure rises to the level of OSHA's PEL. The area or operation must *potentially* be noise hazardous. After gathering relevant data, each student will submit measurement data along with a brief presentation to the class describing the findings, and will offer recommendations for personnel who work or play in that environment.

Suggestions include, but are not limited to:

Newspaper press room
Bottling Plant
Military Ordnance Test Center
Airport
Recreational setting such as Dave & Busters
Bakery
Military Air Station (Andrews AFB or Patuxent River)
Local Firing Range
Motocross or Drag Race
Mining operation
Wood working or furniture making operation

Construction Site
Landscaping operation
Metro subway system
Concert venue
Local bar or restaurant

Suggested Report Format:

Background – Why did you select this site or operation?
Methodology – Describe IN DETAIL what you did: instrumentation used, procedures followed, how equipment was programmed; Keep a time log of what happened when so you can refer to it in your discussion.
Data - What you found: include relevant graphs, charts, and important data such as peak, TWA or LAVG (dBA and dBC), noise dose
Analysis – Your interpretation of what the data means
Recommendations and Conclusions – What you would recommend in terms of noise control, hearing protection, avoidance measures, etc. if someone were to work or play in this environment

Project sites must be approved by instructor. Each student must select a different site to ensure a wide range of samples. Sites must be selected and approved by instructor by **27 SEP 2016.** You will present a powerpoint of your findings on the last day of class on **6 DEC 2016**. Design your powerpoint as if you were presenting it to company personnel. Dr. Gordon-Salant is providing three dosimeters for this project. Please see me to check them out.

UNIVERSITY POLICIES

Academic Integrity

The University administers an Honor Code and an Honor Pledge, available on the web at http://www.jpo.umd.edu/aca/honorpledge/htm. The Code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents, and forging signatures. Students are requested to write the following signed statement on each examination or assignment: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment)." Compliance with the code is administered by a Student Honor Council, which strives to promote a "community of trust" on the College Park campus. For additional information, see the Office of Judicial Programs and Student Ethical Development website (http://www.jpo.umd.edu/)

Accommodations for Students with Disabilities

If you have a documented disability and wish to discuss academic accommodations with me, please contact me before **27 SEP 15**. If necessary, please contact the Disability Support Service (301-314-7682) for assistance in determining and implementing appropriate academic accommodations.

Confidentiality-Posting Grades

The University complies with the regulations set forth in the Buckley Amendment. The amendment protects the student from the disclosure of personal and academic information to anyone other than the student, including parents, except under special circumstances. Posting

student grades with either student names or social security numbers-in while or in part-*is strictly prohibited.* Grades will be available on ELMS), UMEG, or directly from the instructor.

Religious Observances

The University System of Maryland policy on religious observances provides that students *should not be penalized because of observances of their religious beliefs; students shall be given an opportunity, whenever, feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances.* I will make every feasible effort to accommodate student's requests based on attendance of religious observances. *It is the student's responsibility to inform me of any intended absences for religious observances in advance. Notice should be provided as soon as possible, but no later than the end of the schedule adjustment period.* Prior notification is especially important in connection with final examinations, since failure to reschedule a final examination before the conclusion of the final examination period may result in loss of credits during the semester. To review the University's policy or view a variety of other religious holidays, see http://www.faculty.umd.edu/teach/religious.htm.

REQUIRED READINGS

HESP 710 Collection of Readings – are available as .pdf files on the course website.

Recommended Texts:

CAOHC Manual (4th edition)

Rawook, VW, *Hearing Conservation in Occupational, Recreational, Educational and Home Settings,* Thieme, NY, Stuttgart, 2012

The Noise Manual, 5th ed., Eds: Berger, Royster, Royster, Driscoll, and Layne, American Industrial Hygiene Association, 2003