SLHS 596G Cochlear Implants and Other Implantable Hearing and Balance Prosthetics

Mondays, 4:30-7:00 p.m., room 409

Description of Course
This course uses didactic lecture, seminar discussion and problem-based learning to provide the student with depth and breadth of knowledge regarding the science of “electrical hearing” with an implanted neural stimulator. **The course will emphasize theoretical knowledge and research findings** in the areas of neurobiology of hearing and deafness, the biophysics and physiology of “electrical hearing”, speech processing, the psychophysics of electrical stimulation, speech perception with cochlear implants, binaural hearing, bi-modal (acoustic and electrical) hearing and perception of music with cochlear and brainstem implants. Candidacy for implantation, prognosis with electrical hearing, and clinical outcomes from implantation will be discussed. Current technologies for bone-anchored and completely implantable hearing aids will also be considered, including candidacy and clinical outcomes.

Instructor and Contact Information
Instructor: Dr. Barbara Cone
Office Hours: W 2:00-4:00 or by appointment
Office Location: SpH Room 521
Office Phone: 626-3710
Email: conewess@email.arizona.edu
Course Website on D2L

Course Format and Teaching Methods
This course uses didactic lecture, seminar discussion and problem-based learning methods. The instructional format for this course will include the following: lecture, review of research articles and seminar discussion and group problem-solving activities. This course is designed to promote student engagement with and reflection about the content; you are expected to take an active role in the development of your learning.

Course Objectives and Expected Learning Outcomes
The outcomes from this course are that the learners will be able to:

A. Discuss the neurobiology of hearing and deafness.
B. Describe the response of the central nervous system to electrical stimulation of the auditory nerve and cochlear nucleus.
C. Outline issues in the biophysics and physiology of electrical hearing.
D. Describe different methods of speech processing: a) for an engineer or scientist; b) for the parents of a deaf infant.
E. Synthesize the research findings in the area of psychophysics of electrical stimulation.
F. Discuss speech perception with implants and cite research which establishes the range of
speech perception abilities in those with implants. 
G. List and critique the methods used pre- and post surgical assessment of candidates for cochlear implants. Develop a clinical protocol for pre- and post surgical assessment of candidates for cochlear implants.
H. Cite and describe the data-based studies providing cochlear implant outcome data in post-lingually deafened adults, and pre-lingually deafened infants and children.
I. Translate the findings from #H (above) into an informational counseling session that you would use in your clinical practice.
J. Critically analyze the current research on binaural and bimodal cochlear implants and develop candidacy guidelines for your clinical practice; translate your analyses into an informational counseling session that you would use in your clinical practice.
K. Discuss the current findings for music perception with implants and describe how the processing of music differs from that for speech; list the benefits and limitations of current implant technologies for music perception.
L. Describe bone-anchored hearing aid technology and provide objective criteria for determining candidacy. Discuss the audiological outcomes for bone-anchored hearing aids.
M. Discuss the “state of the art/science” of completely-implantable hearing aids and summarize the challenges that are yet to be overcome for such technology.

Absence and Class Participation Policy
The UA’s policy concerning Class Attendance, Participation, and Administrative Drops is available at http://catalog.arizona.edu/2015-16/policies/classatten.htm

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable: http://policy.arizona.edu/human-resources/religious-accommodation-policy.

Absences preapproved by the UA Dean of Students (or dean’s designee) will be honored. See http://uhap.web.arizona.edu/policy/appointed-personnel/7.04.02

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures. Please notify the instructor by e-mail if you need to miss a class due to illness or emergency.

Course Communications
Communication will be conducted using UA e-mail address and D2L.

Required Texts or Readings

Required


Optional

An extensive reading list is provided, and all articles are available on the D2L course web-site. We will be using the reading list in conjunction with the textbooks.
Assignments and Examinations: Schedule/Due Dates

There are two written assignments that will be given during regular class times. These will be open-book, open note exams. They will be released on-line at 4:30 p.m. on that day, and due the same day by 10:00 p.m. They are "in-class" by time-frame only. They may be completed from home if the student desires.

If you score lower than 80% on an assignment you will be given the opportunity to complete additional work to demonstrate, if not mastery, 80% or greater competence in the area. These must be completed within two weeks of the original assignment.

Final Examination or Project

The final exam is on Monday 12 December at 6:00-8:00 p.m. Please be aware of the regulations surrounding final exams: [http://www.registrar.arizona.edu/schedule101/exams/examrules.htm](http://www.registrar.arizona.edu/schedule101/exams/examrules.htm), and the Final Exam Schedule, [http://www.registrar.arizona.edu/schedules/finals.htm](http://www.registrar.arizona.edu/schedules/finals.htm)

Grading Scale and Policies

Assessments will be based upon your presentations of research articles, your critique of the articles, your leading of the discussion on assigned topics and reports of problem-solving activities, written assignments and a final exam.

There will be 2 written assignments that are each worth 25% of your grade, and 2 class presentations, singly or in groups, each worth 15%, and a final exam worth 20%.

Evaluation Scale:

A = 100 – 90, B = 89-80, C = 79-70; below 70, don’t even think about it. I anticipate “A” effort from everyone.

University policy regarding grades and grading systems is available at [http://catalog.arizona.edu/2015-16/policies/grade.htm](http://catalog.arizona.edu/2015-16/policies/grade.htm)

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at [http://catalog.arizona.edu/2015-16/policies/grade.htm#I](http://catalog.arizona.edu/2015-16/policies/grade.htm#I) and [http://catalog.arizona.edu/2015-16/policies/grade.htm#W](http://catalog.arizona.edu/2015-16/policies/grade.htm#W), respectively.

Schedule of Lectures and Assignments

Monday 22 August Introduction, History, Neurobiology of Deafness
Articles in “Past, Present and Future of Cochlear Implants” on D2L
(Walzman and Roland Chapter 1,2,3)

Monday 29 Anatomy, biophysics and physiology of electrical stimulation
Articles in “Anatomy biophysics and physiology of electrical stimulation” on D2L
(Walzman and Roland Chapters 4,5)
Zeng chapter 5 (will be distributed)

Monday 5 September: Labor Day, No Class

Monday 12 Sept Implant design and development; surgery; Speech Processing Strategies part I
Articles on Implant, electrode design and development and surgery on D2L
Articles on Speech Processing Strategies on D2L  
(Walzman and Roland Chapters 5,7, 9, 10, 11)

**Monday 19 September:** Written Assignment I (done in class).  

**Monday 26 September** Speech Processing Strategies part II

**Monday 3 October** Psychophysics of electrical hearing  
Assignments regarding evidence base reports (Monday 17 October) are made.  
Articles on Psychophysics of Electrical hearing on D2L  
Zeng, Chapter 7 (This will be distributed)

**Monday 10 October**  
Candidacy issues in infants and children  
Meet with evidence base teams  
Articles on Pediatric Candidacy on D2L  
(Walzman and Roland Chapter 16 and 22)

**Mon 17 October:** October Prognosis and Outcomes: infants and children; Report on recent evidence base concerning age-of-implantation; Report on recent evidence base concerning outcomes in infants and children: Outcomes= language, speech production, academic achievement and social-emotional development/health related quality of life.  
(Walzman and Roland Chapter 15)

Candidacy issues: post-lingual deafened adults; pre and post-assessment measures in adults.  
Articles on Candidacy issues on D2L  
Articles on Outcomes in Adults D2L  
(Walzman and Roland Chapters 6,8)

**Monday 24 October:** Problem solving activity; groups pre-assigned. Work together on presentation to be presented on Monday 31 October. Written Assignment II—distributed, and due on Monday 31 October.

**Monday 31 Prognoses and outcomes: adults; non-traditional candidates; Brainstem Implants;**  
Articles on Outcomes in adults on D2L  
Articles on Brainstem implants on D2L

**Monday 7 November** Reporting of problem solving activity; Bi-modal and hybrid devices  
Articles on Bimodal stimulation on D2L  
(Walzman and Roland Chapter 18)

**Monday 14 Nov:** Binaural implants; Make Assignments re: music perception  
Articles on Binaural implants on D2L

**Monday 21 November** Music Perception with Implants; reports on music perception assignments  
Articles on Music Perception on D2L  
(Walzman and Roland Chapter 19)
Monday 28 Bone anchored hearing aid, completely implantable hearing aid
Articles on Bone-anchored hearing aids on D2L
Articles on other topics of interest

Monday 5 December Vestibular implants; implants for tinnitus treatment; future directions, wrap-up.
Articles on “other topics of interest” on D2L
Walzman and Roland Chapter 21, 23

Final Exam Monday 12 December 6-8 p.m.

Classroom Behavior Policy
To foster a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. Interaction, discussion, and questioning are very much encouraged.

Threatening Behavior Policy
The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations
Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit http://drc.arizona.edu.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

The University Libraries have some excellent tips for avoiding plagiarism, available at http://www.library.arizona.edu/help/tutorials/plagiarism/index.html.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor’s express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy
The University is committed to creating and maintaining an environment free of discrimination;
see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

**Additional Resources for Students**

UA Academic policies and procedures are available at http://catalog.arizona.edu/2015-16/policies/aaindex.html

Student Assistance and Advocacy information is available at http://deanofstudents.arizona.edu/student-assistance/students/student-assistance

**Confidentiality of Student Records**

http://www.registrar.arizona.edu/ferpa/default.htm

**Subject to Change Statement**

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.