Sp H 596G
Cochlear Implants, Brainstem Implants and Bone-Anchored Hearing Aids
Department of Speech, Language, and Hearing Sciences
Fall 2014
TTH 4:00-5:15

Instructor: Dr. Barbara Cone
Office Hours: W 1:00-3:00 or by appointment
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Course Website on D2L

I. Course Description
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.

II. Course Objectives
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.
III. Course Texts

Required


Supplemental


Reading List

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.

IV. Instructional Format

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.

V. Attendance/General Expectations

Attendance is expected. There will be opportunities for participation and contribution in every session. Please notify me if you are unable to make it to the seminar.

VI. Assignments and Knowledge Assessments

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 3 written assignments that are each worth 15% of your grade, and 3 class presentations, singly or in groups, each worth 10%, and a final exam worth 25%.

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.

Statement on Accommodations for Persons with Disabilities: Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements are encouraged to register with the Disability Resource Center and come to me to discuss access issues.

University Standards of Conduct: Students enrolled in SpH 596G are expected to follow University Policies regarding student conduct and plagiarism. Assignments used in this course may not be or have been used to

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1 This book was not available when I put in the book order. I HIGHLY recommend it. Each chapter is a well-synthesized presentation of the best research/evidence base (that existed as of 3 years ago) for the topic discussed. It will serve as a good reference as you start your careers. That being said, the D2L site has even more current research and
meet the course requirements in any other work. Students are expected to have personally done any work on which they place their names. Statement on Course Changes: The instructor reserves the right to modify the syllabus through academic discretion and to adapt to the evolving class needs.

Schedule of Lectures and Assignments

Tu 26 August Introduction and History
Niparko Chapter 6
Articles in “Past, Present and Future of Cochlear Implants” on D2L
(Walzman and Roland Chapter 1)

Th 28 August History (continued); present and future of implants; Neuro-biology of Deafness
Niparko Chapter 2
Articles in “Neurobiology of Deafness” on D2L
(Walzman and Roland Chapter 2,3)

Week of Tu 2 Sept Neurobiology of Deafness. Anatomy, biophysics and physiology of electrical stimulation
Niparko Chapter 4, 5
Articles in “Anatomy biophysics and physiology of electrical stimulation” on D2L
(Walzman and Roland Chapter 4)
Zeng chapter 5 (will be distributed)
(Walzman and Roland Chapter 5)

Tu 9 Sept Implant design and development; surgery ; September Speech Processing Strategies
Niparko Chapter 13
Articles on Implant, electrode design and development and surgery on D2L
Niparko Chapter 7
Articles on Speech Processing Strategies on D2L
(Walzman and Roland Chapters 9, 10, 11)
(Walzman and Roland Chapter 5 and 7)

Tu 16 September Speech Processing Strategies
Reading list
Written Assignment
Written Assignment I—complete in class

Tu 23 September Psychophysics of electrical hearing
Articles on Psychophysics of Electrical hearing on D2L
Zeng, Chapter 7 (This will be distributed)

Tu 29 September: Candidacy issues: post-lingual deafened adults ; Pre-and post assessment measures Adults
Gifford Chapters 1-2, chapter 5, 6 and 9
Niparko Chapters 15, 17
Articles on Candidacy issues on D2L
(Walzman and Roland Chapters 6, 8)

Tues 7 October: Prognoses and outcomes: adults; non-traditional candidates; Problem solving activity
Gifford chapter 5
Articles on Outcomes in adults on D2L
(Walzman and Roland Chapter 16 and 22)
Tu 14 October: Candidacy issues—children; Prognoses and outcomes; infants and children
Gifford chapter 3-5, 7
Articles on Pediatric Candidacy Issues on D2L
Articles on Prognoses and outcomes in infants and children on D2L
(Walzman and Roland Chapter 15)

Tu 21 October: Prognoses and outcomes: infants and children; Problem solving activity
Niparko chapters 21, 22, 25
Written Assignment II distributed, due on 27 October.

Tu 28 October: Report of Problem Solving; Brainstem Implants; Bimodal stimulation and hybrid devices
Articles on Brainstem Implants on D2L
Articles on Bimodal stimulation on D2L
(Walzman and Roland Chapter 18)

Tu 4 Nov: Binaural implants
Articles on Binaural implants on D2L

Tu 11 November: Veterans Day- No Class

TH 13 November: Music perception with implants
Niparko Chapter 16
Articles on Music Perception on D2L
(Walzman and Roland Chapter 19)

Tues 18 November
No class —Written assignment III distributed due Wed 26 November

Tu 25 November: Bone anchored hearing aid; Bone-anchored hearing aid; completely implantable
Articles on Bone-anchored hearing aids on D2L

Tu 2 December: Completely implantable; vestibular implants; implants for tinnitus treatment
Articles on “other topics of interest” on D2L
(Walzman and Roland Chapter 21)

Tu 9 December: Future directions—wrap up
(Walzman and Roland chapter 23)

Final Exam Tuesday 16 December 3:30-5:30 p.m.