COURSE OUTLINE
CSD 9526a Modern Practices in Assistive Hearing Technologies: Hearing Aids
The University of Western Ontario, Fall Semester, 2016

Instructors: Susan Scollie, Ph.D., Room 2262H (NCA), ext 88948 scollie@nca.uwo.ca
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Overview and Purpose of Course:

This course will support advanced clinical practice in prescribing and verifying hearing aids, with an emphasis on evidence-based use of procedures and technologies. Advanced knowledge of the scientific foundations underlying current clinical practice will be supported and expected. Reading and discussion of evidence and modern protocols will critically evaluate advanced procedures in real ear measurement, prescription, digital signal processing (DSP) features, and outcome measurement.

Required Textbook:


Grading Scheme:

<table>
<thead>
<tr>
<th>Test #1</th>
<th>30%</th>
<th>October 26, 2016, in class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test #2</td>
<td>30%</td>
<td>November 21, 2016 in class</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
<td>During the exam period.</td>
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</table>

NOTE: You are required to attend all sessions and to contribute effectively to your group’s work, and to integrate knowledge from ongoing and past coursework and practica into your work on this course.

Academic Integrity: Students are reminded that they are required to follow the standards of scholarship within the University community. Students are encouraged to review the standards and the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_grad.pdf

The standards include, but are not limited to, proper citation of sources of information. Students are encouraged to learn together, but are required to generate their own written work and cite and give credit to, where necessary, the sources and authors of information (i.e., do not plagiarize). Scholastic offences are taken seriously.

Electronic devices: Active pagers, cell phones, laptops, and/or internet connections including email are not allowed in class unless instructors indicate they are to be used in a specific classroom activity.
Accessibility: Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at http://www.sdc.uwo.ca/ssd/ or 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

Support Services:
- Student Development Centre, http://www.sdc.uwo.ca/
- USC Student Support Services, http://westernusc.ca/services/

Graduate Course Health and Wellness Insert for Graduate Course Outlines

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western’s Campus Recreation Centre. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page http://www.music.uwo.ca/, and our own McIntosh Gallery http://www.mcintoshgallery.ca/. Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca/

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html

To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.
**Timetable of Topics in this Course and Related Activities:**

Colour key indicates primary instructor:  
Susan Scollie  
Vijay Parsa

<table>
<thead>
<tr>
<th>Lecture Date</th>
<th>Lecture Topic</th>
<th>Reading Material</th>
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</thead>
</table>
| Sept. 12     | Hearing aid components & DSP review                                           | Sandlin (2014)  
Chapter 7, pp 222- 232  
Also Dillon (2012) Chapter 2  
(covered in CSD 9513) |
Souza (2002) |
| Sept. 19 & 21| World Congress of Audiology                                                   |                                                                                  |
| Sept. 26     | Prescriptive methods I                                                        | Bentler, Mueller, & Ricketts (2016)  
Chapter 4 |
| Sept. 28     | Prescriptive methods II: Infant fitting, conductive corrections, venting corrections | Bagatto & Scollie (2011)  
Bentler, Mueller, & Ricketts (2016)  
Chapter 4  
Readings as listed |
Blamey (2005) |
Kuk (2010) Primer |
| Oct. 10      | No class (Thanksgiving)                                                       |                                                                                  |
Hayes (2006)  
Other readings as listed |
<p>| Oct. 17      | Profound hearing losses, dead regions                                         | Souza (2002) sections on severe to profound losses |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading Material</th>
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<tbody>
<tr>
<td>Oct. 19</td>
<td>Case discussions, candidacy, fine tuning, troubleshooting</td>
<td>Bring your textbook please</td>
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<td></td>
<td></td>
<td>Readings as listed</td>
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<tr>
<td></td>
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<td>Scollie et al. (2016)</td>
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<td>Other readings as listed</td>
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<tr>
<td>Oct. 26</td>
<td><strong>Test 1</strong> (cumulative incl. Oct 24, excluding wireless topic)</td>
<td>Sandlin (Chapter 6)</td>
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<td>Ricketts (2001)</td>
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<td></td>
<td></td>
<td>Other readings as listed</td>
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<td>Nov. 2</td>
<td>Directional technologies – II</td>
<td>Sandlin (Chapter 7)</td>
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<td></td>
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<td>Bentler &amp; Chiou (2006)</td>
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<tr>
<td>Nov. 7</td>
<td>Digital noise reduction</td>
<td>Sandlin (Chapter 7)</td>
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<td></td>
<td></td>
<td>Bentler &amp; Chiou (2006)</td>
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<tr>
<td>Nov. 9</td>
<td>Feedback control</td>
<td>Sandlin (Chapter 7)</td>
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<td>Nov. 16</td>
<td>Cognition &amp; Training</td>
<td>Sandlin (Chapter 7)</td>
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<td></td>
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<td>Banerjee (2011)</td>
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<tr>
<td>Nov. 21</td>
<td><strong>Test 2</strong> (includes wireless &amp; remote mic topic)</td>
<td>AAA CPG for FM fitting</td>
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<td>Other readings as listed</td>
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<td></td>
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<td>“Hearing Aids and Telephones”</td>
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<tr>
<td></td>
<td></td>
<td>Bentler, Mueller, &amp; Ricketts (2016)</td>
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<td></td>
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<td>Chapter 7</td>
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<tr>
<td>Nov. 23</td>
<td>Clinical protocols for remote microphone and phone fitting. Venting</td>
<td>Sandlin (2014)</td>
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<tr>
<td></td>
<td>Review</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Nov. 28</td>
<td>Tinnitus Maskers and therapeutic sounds</td>
<td>Bentler, Mueller, &amp; Ricketts (2016)</td>
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<td>Chapter 10</td>
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<tr>
<td>Nov. 30</td>
<td>Outcomes Assessment in Adults</td>
<td>Other readings as listed</td>
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<tr>
<td>Dec. 5</td>
<td>Outcomes Assessment (Guest: Marlene Bagatto)</td>
<td>Readings as listed</td>
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<tr>
<td>Dec. 7</td>
<td>Case presentations</td>
<td></td>
</tr>
<tr>
<td>Final exam period</td>
<td>Final exam (cumulative)</td>
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COMPETENCIES RELEVANT TO THIS COURSE:

CASLPA COMPETENCY COVERAGE:

1.7 INSTRUMENTATION
Demonstrate basic knowledge of:
i. The instrumentation relevant to clinical practice and its operation (e.g., amplification and assistive devices, audiometers, audio and video recorders, voice and speech synthesizers and analyzers).
ii. Advanced knowledge of certain aspects (The instrumentation relevant to clinical practice and its operation (e.g., amplification and assistive devices, audiometers, audio and video recorders, voice and speech synthesizers and analyzers))

1.9 RESEARCH METHODOLOGY
Demonstrate basic knowledge of:
i. The scientific method.
ii. Basic statistical concepts and theories.
iii. Commonly used research designs.
iv. How to critically evaluate research.
v. Systematic evaluation of the reliability and validity of assessment procedures, and of treatment efficacy.

Application of concepts from 1.9 Research Methodology (basic knowledge) as they pertain to the evidence-based evaluation of signal processing efficacy/effectiveness, especially 1.9.iv and v.

AND: 2.4 Reporting

UNIT THREE: CLIENT MANAGEMENT

3.2 AMPLIFICATION AND ASSISTIVE LISTENING DEVICES
Demonstrates knowledge in the following areas:
i. Current Principles and Methods of Selection and Fitting:
d) Verification strategies, including real ear measurements and sound field evaluation.
e) Validation of hearing aid benefits (outcome measures, self-assessment questionnaires).

3.2.d and e: Verification and validation of hearing aid fittings

4, 5 Modification of procedures to allow accurate and timely client management for the infant/neonatal, and preschool/school-aged populations, throughout and particularly:

UNIT FOUR: NEONATAL AND INFANT POPULATIONS

4.3 COUNSELLING
Demonstrates the ability to:
i. Communicate diagnostic information, its implications, and resulting habilitative recommendations to caregivers and referral sources.
ii. Understand the effects of hearing loss in daily life and of emotional reactions to hearing handicap.

4.4 (RE)HABILITATION
Demonstrates knowledge of:
vi. Special considerations for selection, evaluation, and monitoring of hearing devices

4.3, 4.4 Counselling and habilitation, especially 4.4.vi – special considerations for device fitting.
Updated required chapters and articles (harmonized with CSD 9528) (Sections requiring or suggesting chapters from textbooks are highlighted)

Hearing aid components & DSP review:

Review materials from last year’s course and/or read ahead as you wish. This lecture is intended as a refresher, and is based on:

1. Chapter 2, Dillon’s book on Hearing Aids. Relevant scanned pages from this book were used in CSD 9513 for the DSP lecture. You should have access to this in OWL.

Level-dependent processing: (Souza and the Compression Handbook by Banerjee and Blamey 2005 support lecture content, remainder are needed for 9528 Unit 3 Assignment)


Candidacy and Selection:

2. Goal-setting sections of Chapter 5 of Bentler, Mueller, & Ricketts (2016)

The readings below give a “big picture” overview of amplification, selection, and benefit in modern hearing aid prescription and dispensing.)


Prescription, programming, fit to targets, and infant prescription:
1. Bentler, Mueller & Ricketts, Chapter 4
   a. UWO PedAMP resources for fit to targets and SII worksheets are also handy for 9528 assignments in this topic area, and may be freely downloaded from: www.dslio.com
   a. This reading is supplemental to the coverage offered in Bentler, Mueller & Ricketts Ch 4
   a. This is listed as a course resource for your Unit Two requirement in 9528 and does not need to be “studied” for exams.
5. Programming hearing aids guide posted to OWL.

Hearing Aid Orientation & Troubleshooting
1. Bentler, Mueller & Ricketts, Chapter 4
2. Seewald & Tharpe, Chapter 29

Frequency Lowering:
2. Relevant sections of your textbook chapters:
   a. Bentler et al: begins on page 343

Fitting Unilateral/asymmetrical hearing losses:
   [Link to the article](http://www.audiologyonline.com/articles/article_detail.asp?article_id=1632)

3. AAA Draft Guideline for adults with unilateral hearing loss

[This marks the end of readings that are included in Test 1 of CSD 9526]

**DNR, Directionality, and Feedback cancellation:**

**Verification of: (these will orient you to measures used in CSD 9528)**

1. The Bentler, Mueller, & Ricketts textbook provides an excellent overview in Chapter 7, starting on page 338. These procedures are also discussed in:
   b. McReery, R. (2011). Pediatric Hearing Aid Fittings: Selection and Verification of Features, AudiologyOnline,  
      [Link to the article](http://www.audiologyonline.com/articles/article_detail.asp?article_id=2399)


   [Link to the article](http://journals.lww.com/thehearingjournal/Fulltext/2009/09000/Verification_and_what_to_do_until_your_probe_mic.3.aspx)

   (http://journals.lww.com/thehearingjournal/Fulltext/2009/10000/Verification_and_what_to_do_u ntil_your_probe_mic.3.aspx)

**How directional mics work, and evidence:**


In part-II, we will look at recent evidence surrounding binaural beamforming technologies. Relevant articles and information:


**How DNRs work, and evidence:**


**Environmental Classifiers:**

**Feedback Cancellers:**

**Wireless and Remote Microphone Technologies:**

[This marks the end of readings that are included in Test 2 of CSD 9526]


**Hearing aids and Telephones:** (See mobile phone compatibility section in Dillon text)

**Occlusion, venting, and RECD applications in real ear measurement:** (Review Sandlin Chapter 3 as required)
1. Bentler, Mueller, & Ricketts cover verification of this in chapter 7, starting about page 302, and Figure 7-8 is key. These concepts are also discussed in:
**Products for special populations:** (tinnitus maskers, personal amplification systems, and OTC hearing aids)

**Tinnitus Maskers (overview & evidence):**
Please review the international consensus materials on assessment and outcome measurement at: 

We will review the following sample programs and tools:

- [http://journals.lww.com/ear-hearing/Abstract/2012/03000/The_Tinnitus_Functional_Index_Development_of_a.2.aspx](http://journals.lww.com/ear-hearing/Abstract/2012/03000/The_Tinnitus_Functional_Index_Development_of_a.2.aspx)

**Over the counter/internet/app hearing aids (not required):**
1. A sample opinion piece:  
2. A call for research, with summary of relevant demographics:  
   [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873193/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873193/)
3. A sample product:  
4. A currently funded research project attempting to create and understand a self-fitting hearing aid:  
   [http://www.hearingcrc.org/research/projects/r431](http://www.hearingcrc.org/research/projects/r431)

**Outcome measures for adults and children:**

2. See also Hickson et al (2010) from week 1 for info on factors affecting outcome).

The readings below are references for specific tests that will be covered in 9526/9528. Practical knowledge of test administration and interpretation is required, memorization is not.


Effects of Cognition and Auditory Training:


