



McGILL UNIVERSITY
Faculty of Medicine
School of Communication Sciences & Disorders
Winter 2020

SCSD-631
Speech Science
Number of Credits: 3 Credit
Course Time: Monday; 9:00-11:00
Location: SCSD, Room 862

Instructor: Isabelle Marcoux
Office: SCSD, Room 819
Office Hours: Friday 2:45-3:45 by appointment (set up by email)
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COURSE OVERVIEW: This course will provide the scientific bases of speech communication. The objective is to build a basic understanding of speech acoustics, speech production and speech perception that can be applied to understand speech processes in normal and disordered populations as well as providing practical skills for the analysis of speech in a clinical setting.

INSTRUCTIONAL METHOD:

This class will include lectures, class discussion and hands-on, classroom and lab-based activities. Assessment methods include assignments, quizzes and a final exam.

REQUIRED COURSE MATERIALS:

- Carole T. Ferrand. 2017. *Speech Science: An integrated approach to theory and clinical practice (Fourth Edition)*. Allyn and Bacon. **OR**
- Carole T. Ferrand. 2013. *Speech Science: An integrated approach to theory and clinical practice (Third Edition)*. Allyn and Bacon.
- other readings available on course website
- Software: Praat (for any operating system) download from <http://www.fon.hum.uva.nl/praat/>

LEARNING OBJECTIVES:

ROLE 1: EXPERT

Speech-language pathologists apply their knowledge of the development and disorders of communication, as well as feeding and swallowing, together with their assessment and intervention skills to provide professional, client-centered care to individuals across the lifespan. This role is central to the function of speech-language pathologists.

1.1 KNOWLEDGE EXPERT

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| a) . Apply profession-specific knowledge to prevent, identify and manage communication disorders, and feeding and swallowing disorders across the lifespan. | |
| <ul style="list-style-type: none"> • Apply basic knowledge of source-filter theory. • Apply basic knowledge of acoustic-articulation link. • Apply basic knowledge of perturbation theory. | <ul style="list-style-type: none"> • Assignment 1: Vowels • Assignment 2: Fricatives • In-class activity: Bio feedback • Quiz 1: Basic acoustics, Spectrograms • Quiz 2: Source-Filter Model and Vowel Articulation • Quiz 3: Consonant Articulation • Quiz 5: Voice and Biofeedback • Final exam |
| c) Apply knowledge of hearing, hearing loss and disorders of the auditory system to the practice of speech-language pathology. | |
| <ul style="list-style-type: none"> • Identify and understand the type of acoustic information that is lost with high frequency hearing loss or cochlear implants. • Understand the role of informational masking in speech perception under noise. | <ul style="list-style-type: none"> • In-class activity: Perception under Adverse Listening Conditions • Quiz 4: Speech perception and Hearing loss |
| 1.2 CLINICAL EXPERT | |
| f) Plan, conduct and adjust an assessment. g) Analyze and interpret assessment results. | |
| VOICE <ul style="list-style-type: none"> • Apply knowledge of acoustic properties of voice to analyze a representative sample of speech from a healthy older adult and make comparisons to appropriate norms. | <ul style="list-style-type: none"> • Assignment 3: Voice Report |
| SPEECH <ul style="list-style-type: none"> • Apply knowledge of the acoustics-articulation link to analyze articulation abilities from samples of speech and compare to appropriate norms. • Rate disordered samples for articulation speed, accuracy and intelligibility. • Measure articulation rate. | <ul style="list-style-type: none"> • Assignment 1: Vowels • Quiz 2: Source-Filter Model and Vowel Articulation • Quiz 3: Consonant Articulation |
| RESONANCE <ul style="list-style-type: none"> • Rate type and degree of resonance disorder. | <ul style="list-style-type: none"> • In-class activity: Resonance |

h) Implement an intervention plan.

- Explore various bio-feedback techniques to improve articulation

In-class activity: Bio feedback

COURSE CONTENT

Tentative Schedule of Topics – subject to change

***All readings are from the 4th edition of the text book.
See myCourses for version from the 3rd edition.

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| Week 1: | Jan 6 | Basic acoustics (sound waves, decibels, simple and complex waves, fourier analysis) | Ferrand Ch 1 p7-39 |
| Week 2: | Jan 13 | Fundamental frequency, Harmonics, Pitch, Spectrogram, Acoustic characteristics of phonation (periodic source) | Ferrand Ch 4, p137-154 |
| Week 3: | Jan 20 | Production of vowels, Source-filter model, Perturbation theory for vowels | Ferrand Ch 1 p39-50 Ch 6 p221-223 (optional) Ch 6, 223-237 |
| Week 4: | Jan 27 | Measuring formants, Measuring vowel space, Clinical applications | Ferrand Ch 6 p195-221 (optional) Ch 7 p260-276 |
| Week 5: | Feb 3 | Stops and fricatives production, Quantitative analysis of fricatives, Covert contrasts. | Ferrand Ch 6, p240-246 Kent & Read, 38-43 Nissen & Fox, 2005 |
| Week 6: | Feb 10 | Spectral moment analysis Nasal consonants and vowels, Nasality and resonance, Liquids and glides | Mandaluk, 2011 Ferrand Ch 6 p238-240 Ch 7, 276-278 Kummer, 2011 a and b |
| Week 7: | Feb 17 | Prosody, Articulatory and acoustic correlates of intelligibility, Articulation accuracy, Formants dynamics | Ferrand Ch 6 p246-252 |

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|----------|---------------|---|---|
| Week 8: | Feb 24 | Speech perception | Ferrand, Ch 8 p293-304 |
| | MAR 2 | STUDY WEEK | |
| Week 9: | Mar 9 | Speech perception in non-optimal conditions, (Noise, hearing impairment, older adults) | Ferrand Ch 9, p314-326 |
| Week 10: | Mar 16 | Voice analysis: Characteristics of phonation, Voice range profile, Clinical measures of voice | Ferrand Ch 5, p155-163 Lab: Baken Ch 5, p107-134 Baken Ch 6, p167-214 |
| Week 11: | Mar 23 | Biofeedback, Ultrasound demo | Ferrand Ch 7 p255-260 |
| Week 12: | Mar 30 | Speech motor control (Planning, auditory and somatosensory feedback, prosody) | Ferrand Ch 10 p369-379 |
| Week 13: | Apr 6 | Review | |
| | Apr 20 | FINAL EXAM | |

EVALUATION:

Evaluations consist of 3 assignments, 5 quizzes and a final exam with this breakdown:

- **Assignments: 50%**
- **Quizzes: 25%**
- **Final exam: 25%**

| Assignment | Due Date | Sub Roles Targeted | Expected Performance Level |
|-----------------------------|----------|-------------------------|----------------------------|
| Lab 1: Vowels (16,7%) | Feb 10 | Foundational Principles | Advanced beginner |
| Lab 2: Fricatives (16,7%) | Mar 9 | | |
| Lab 3: Voice Report (16,7%) | Apr 6 | | |

| Quiz | Dates Available |
|--|-----------------|
| Quiz 1 Basic acoustics, Spectrograms (5%) | Jan 14-19 |
| Quiz 2 Source-Filter Model and Vowel Articulation (5%) | Jan 28 - Feb 2 |
| Quiz 3 Consonant Articulation (5%) | Feb 18-23 |
| Quiz 4 Speech perception and Hearing loss (5%) | Mar 10-15 |
| Quiz 5 Voice and Biofeedback (5%) | Mar 24-29 |

Assignments: Unless otherwise indicated, assignments can be done in groups of up to 3 students. A single submission should be made with all group members' names. All group members will receive the same grade. Where required to submit your own work, you may discuss your work with others but you must write it up on your own. Near identical answers will be treated as probable cases of scholastic dishonesty and will be reported to the Office of the Dean of Students.

Quizzes: will be completed online through MyCourses during a set window of time. They are open book but must be completed on your own. The objective of the quizzes is to consolidate your learning and help you track what you do and don't know. Therefore, please do not talk to your classmates who have already taken the quiz about the content of the quiz before you take it.

Final exam: will be completed individually, in class, **on April 20**, on paper format. No material or notes will be allowed.

Submission: of assignments will be accepted *electronically*. Assignments are due at the beginning of class on the due date. No late assignments will be accepted unless you contact me with a legitimate excuse *if possible before the due date, or within 24 hours* (followed up with a valid written document) and I agree to make exceptional arrangements with you. If I agree to accept your late assignment but you don't provide a valid written document, you will lose 10% of the grade for that assignment each day you're late.

Grading: Assignments will be graded with a rubric according to exceeds/meets/doesn't meet expectations. Work which meets expectations will receive 80%. In many cases comments may also be provided to improve your learning. If you would like additional feedback, please contact the instructor.

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Academic Integrity

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Language of Submission

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Additional Statements

- The [University Student Assessment Policy](#) exists to ensure fair and equitable academic assessment for all students and to protect students from excessive workloads. All students and instructors are encouraged to review this Policy, which addresses multiple aspects and methods of student

assessment, e.g. the timing of evaluation due dates and weighting of final examinations.

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- As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the [Office for Students with Disabilities](#), 514-398-6009.
- End-of-course evaluations are one of the ways that McGill works towards maintaining and improving the quality of courses and the student's learning experience. You will be notified by e-mail when the evaluations are available. Please note that a minimum number of responses must be received for results to be available to students.
- In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.
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- McGill University is on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. We acknowledge and thank the diverse Indigenous people whose footsteps have marked this territory on which peoples of the world now gather.