UNIVERSITY OF CALGARY

Department of Psychology
Psychology 471– Auditory Processing
Winter 2011 – Course Outline

Instructor:	Suzanne Curtin	**Lecture Location:**	A 253
Phone:	403-220-7670	**Lecture Days/Time:**	MWF 12:00-12:50
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Office:	ADM 260		
Office Hours:	by appt.		

Course Description

This course will take a multidisciplinary approach to understand the neural systems that contribute to auditory perception, using music and speech as domains of inquiry. We will explore this from an **auditory cognitive neuroscience** perspective. Students will master topics in acoustics, psychophysics, cognitive psychology, cognitive development, neurophysiology, and neuropsychology. The early part of the course will provide students with a common foundation in acoustics, signal processing, and auditory neuroscience. Later in the semester, the focus will turn to developing analytical skills through critical evaluation of primary-source experimental literature. Hands-on exercises in sound manipulation and experimentation also will constitute a means of learning about auditory processing. Throughout, the focus will be upon understanding general cognitive and perceptual challenges in perceiving and producing complex sounds like speech and music.

Course Goals / Learning Objectives

- In this course, we will use music and speech as a means of understanding auditory processing from a neuroscience perspective.
- A primary goal is intellectual synthesis. Strive to organize disparate facts into coherent wholes.
- Learn foundations of acoustics, sound, and auditory processing.
- The course is reading-intensive. You will learn to think critically about research and to summarize research orally and in writing.
- Think about the broad theoretical questions and about research methods available to address these questions.
- Learn to conduct a literature review.
- Review the literature, read articles and synthesize the material, thinking critically about scientific information.
- Develop your scientific writing skills.
- Prepare a coherent thesis and argue for it with citations from the scientific literature.
- Develop your oral presentation skills by presenting your project to your peers.

Prerequisites
Psyc 312 – Experimental Design and Quantitative Methods
Psyc 369 – Sensation and Perception

Required Text
Plack, C.J. (2005). *The Sense of Hearing.* Lawrence Erlbaum Associates: Mahwah, New Jersey.

This course is reading intensive. Be prepared to read a number of primary source articles and chapters and to turn in summaries for some of them (see class schedule).

Evaluation

Written Summaries (9% of final grade - 3% each, to be turned in during class)
As noted on the Class Schedule, you are expected to write a critical summary (approx. one page) of assigned papers (total of 3). Each summary should be titled with the full reference of the paper reviewed. A "critical summary" entails three parts: first, a synopsis of the article which should illustrate both your understanding of the text's salient arguments as well as your ability to summarize these points succinctly and clearly. In general, this should be accomplished in about 1 paragraph. The second part should contain your assessment of the article's weaknesses and strengths and/or its relationship to other articles for the week. Strive to synthesize the "big picture" theoretical questions and relate them to themes in the course. Finally, suggest several questions for discussion. Bullet points are fine for this section; this need not be a thesis, but it should illustrate your understanding of the material. You should keep a "notebook" of these summaries; if you do them well, they will be very helpful in preparing for the exams. (More detailed info below)

Discussion Leader (6% of final grade)
For each discussion topic, there will be assigned discussion leaders. The discussion leaders will take responsibility for leading discussion, ensuring that the class engages the relevant issues of the week and highlighting major points. You may be creative with this role – brief presentations, demonstrations, examples, and even props are welcome. All students are expected to participate in all discussions.

Exam 1 (25% of final grade; Feb 14) & Exam 2 (25% of final grade; Mar 21)
Exams will be short answer and essay style questions. Material from tutorials, discussions, hands-on exercises, and readings will be covered. No study aids will be permitted during exams.

Final Review Paper (25% of final grade; due 04/22/11 AT NOON; drop in Psych 'Green Box')
At the end of the semester, you will submit a paper reviewing a research topic relevant to the course goals. You may use this as an opportunity to investigate a topic in auditory processing that we have not discussed in class or to investigate more deeply one of the topics of the course; you should follow your own interests. **No late papers will be accepted.**

Hands-On Exercises (10% of final grade – 5% each, upload to Blackboard using drop box)
Two exercises will be completed when we visit the ARTS computer lab (see schedule). They include manipulating sound files and creating acoustic stimuli. The first exercise may require some additional time outside of the class to complete (**5%** of final grade), the second will be

completed during class time (**5%** of final grade). See schedule below for details. All exercises will be uploaded to Blackboard using the digital drop box. **No late exercises will be accepted.**

Grading Scale

A+	96-100%	B+	80-84%	C+	67-71%	D+	54-58%
A	90-95%	B	76-79%	C	63-66%	D	50-53%
A-	85-89%	B-	72-75%	C-	59-62%	F	0-49%

As stated in the University Calendar, it is at the instructor's discretion to round off either upward or downward to determine a final grade when the average of term work and final examinations is between two letter grades. In this course there will be no rounding up of final grades, especially in light of the opportunities students have to increase their final grade via research participation.

Tentative Schedule

Week	Date	Topic	Assigned Reading	Other Assignments
1	**01/10**	**Course Introduction & Overview**		
	01/12 **01/14**	**Tutorial #1:** **What is Sound? (Part 1)** If a tree falls in the woods…does it make a sound? Describing sound physically Describing sound mathematically Describing sound psychologically Waves The Simplest Sound	Plack, C. J. Chapter 1, Introduction. Plack, C. J., Chapter 2, The Nature of Sound	*Please come to class having read Chapters 1 and 2 of "The Sense of Hearing".* *The next few classes are tutorial style. You will get the most out of the tutorials if you have prepared by reading the assigned reading.*
2	**01/17** **01/19**	**Tutorial #2:** **What is Sound? (Part 2)** More Complex Sounds Visualizing Sound Harmonics and Noise Frequency and Amplitude Modulation	Plack, C. J., Chapter 2, The Nature of Sound	*You will probably need to read Chapter 2 again to get a good handle on it…There is a lot of content in this short chapter.* *Please read it again after Monday's lecture.*
	01/21	**Tutorial #3:** **What is Sound? (Part 3)** Production, Propagation & Processing Resonance Intro to Music Acoustics Fourier Analysis	Plack, C. J., Chapter 3,	*Please come to class having read Chapter 3 of "The Sense of Hearing"* *01/21: Last day to drop a course with no W grade and tuition refund.*
3	**01/24** **01/26** **01/28**	**Hands-on Exercise #1:** **Making Math "Sing"**	*No reading assignment this week.* ***Meet in the ARTS computer lab in SS 018 Section 3** for a hands-on acoustics exercise*	*Please bring a pair of headphones (ipod style is fine) to class today.* *If needed, work outside of class to complete **Hands-on Exercise #1 assignment, due noon 02/04/11 if not completed during lab time.*** *01/24: Last day for registration/change of registration.*
4	**01/31**	**Tutorial #4:**	Strong, W. J. & Plitnik,	

		Music Acoustics	G. R. (1992) Chapter 33	
	02/02	**Discussion:** **Music from a Cognitive Neuroscience Perspective** What is Auditory Cognitive Neuroscience? Why is it more poorly understood than Visual Cognitive Neuroscience? What can be gained from understanding Auditory Cognitive Neuroscience? What does Music contribute?	Sacks, O. (2006). Peretz, I. (2006). Stevens, C. & Byron, T., (2009). Peretz, I. & Zatorre, R. (2005).	*Come to class ready to discuss assigned reading (see below for advice on how to prepare)* *Prepare Written Summary for Stevens & Byron 2009 (see below for instructions) and turn in during class.*
	02/04	**Tutorial #5:** **Voice Acoustics: Speech**	Plack, C. J., Chapter 11,	***Download and look over "How to Conduct a Literature Search" document from Blackboard – review this before class.*** ***Hands-on Exercise #1 assignment, due at beginning of class if not turned in by end of lab 01/28.***
5	**02/07**	**Tutorial #6:** **Voice Acoustics (continued…)**		*For fun…* *Speech to Song Illusion:* *http://www.acoustics.org/press/156th/deutsch.html*
	02/09 **02/11**	**Tutorial #7:** **Voice Acoustics: Singing**	Strong, W. J. & Plitnik, G. R. (1992). Chapter 32.	
6	**02/14**	**In-Class Exam #1**		
	02/16 **02/18**	**Tutorial #8:** **The Auditory System (Part 1)** From Cochlea to Cortex – An Overview	Plack, C. J., Chapter 4.	*Download the **Auditory System Coloring Book and familiarize yourself with the anatomical terms.*** *Download the **Brain Topography Coloring Book and familiarize yourself with the anatomical terms**. Pay particular attention to the details of the temporal lobe.* *Please bring these documents to class.*
Reading Week				
7	**02/28**	**No Class**		
	03/02 **03/04**	**Tutorial #9:** **The Auditory System (Part 2)** Higher-order Auditory Processing Anatomy Overview Methods Overview	Kaas JH, Hackett TA, & Tramo MJ. (1999). Tervaniemi M, et al. (2006). Staeren N, Renvall H, De Martino F, Goebel R, Formisano E. (2009). Leech, R., Holt, L. L., Devlin, J. T., Dick, F. (2009).	***Prepare Written Summary** of Staeren et al. 2009 (see below for instructions) and turn in during class on 03/02.*
8	**03/07** **03/09**	**Tutorial #10:** **Auditory Processing – Pitch**	Plack, C. J., Chapter 7, Stainsby, T., & Cross, I. (2009) 47-58.	***Prepare Written Summary** of Bendor & Wang (see below for instructions) and turn in during class on 03/07.*

		How is pitch different from frequency? How do the ear and brain work together to create pitch?	Bendor D & Wang X. (2006).	
	03/11	**Tutorial #11:** **Auditory Processing - Sound Objects & Sequences** The problem of sound source segregation What counts as an "auditory object"?	Plack, C. J., Chapter 10. Deutsch D. (2007) van Zuijen TL, et al. (2004) Naatanen, R. Et Al. (2001).	
9	**03/14** **03/16** **03/18**	**Hands-on Exercise #2:** Sound Synthesis: Making an Auditory Illusion	*Meet in the ARTS computer lab SS018.*	***Hands-on Exercise #2: assignment, due end of class 03/18/11.***
10	**03/21**	**In-Class Exam #2**		
	03/23 **03/25**	**Discussion of Class Projects**		***Final Paper Topic Description due in class on 03/23– See handout on Blackboard for instructions.***
11	**03/28**	**Discussion:** **Absolute Pitch**	Zatorre RJ. (2003) Ross, D. A., Gore, J. C., & Marks, L. E. (2005). Levitin, D. J., & Rogers, S. E. (2005). Deutsch, D. et al. (2006). Deutsch, D. (2006).	*For fun:* *Take an online test of absolute pitch:* *http://detrave.net/nblume/perfect-pitch/*
	03/30	**Discussion:** **Music & Language**	Wong PCM, et al. (2007). Iversen, J.R., Patel, A.D., & Ohgushi, K. (2008). Chan AS, Ho YC & Cheung MC. (1998). Patel, A. (2009) Racette A, Bard C & Peretz I. (2006).	Supplementary Material: http://www.nature.com/neuro/journal/v6/n7/suppinfo/nn1082_S1.html http://www.brams.umontreal.ca/plab/research/Stimuli/aphasics_sing/aphasics_sing.html
	04/01	**No Class**		
12	**04/04** **04/06**	**Discussion:** **Plasticity**	Schlaug, G. (2009) Münte TF, Altenmüller E & Jäncke L. (2002) Rauschecker JP. (1999) Elbert T, et al. (1995). Shahin, A., Bosnyak, D., Trainor, L. J., & Roberts, L. E. (2003).	***Outline of Final Paper Due in Class – 04/04. See Blackboard for details***
	04/08	**Discussion:** **Lessons from Development**	Parncutt, R. (2009). Trehub, S. E. (2009). Hannon, E. E., & Trainor, L. J. (2007). Plantinga, J., & Trainor, L. J. (2009).	
13	**04/11**	**Discussion: Dev Cont.**		

13	**04/13** **04/15**	**<u>Discussion:</u>** **Musical Training & Effects of Music on Cognition**	Norton, A. et al., (2005). Fujioka T, et al. (2006). Gaab N, et al. (2004). Rauscher, F. H., (2009). Schellenberg, E.G., & Peretz, I. (2008).	*04/14: Last day to participate in research and allocate research credits.* *04/15: Lecture ends. Last day to withdraw.*

Additional Course Information

Written Summaries

Strive to describe the answers to these questions in very general terms that someone outside the field could understand. Imagine you are writing a *New York Times* science article, for example. Here are some questions to help motivate your discussion:

- What is the paper about? Why is it of interest in understanding human cognition?
- What justifies or motivates the present research?
- What is surprising about the results?
- What is the primary hypothesis tested in the experiment(s)? Was it confirmed or disconfirmed?
- How was the hypothesis tested? Using what experimental design? What kind of data was collected? How was it analyzed?
- Which figure provides the strongest evidence for the hypothesis? Be prepared to describe this figure and why it provides support for the authors' claims.
- Are there any serious design flaws or confounds with this study? If you were reviewing this article, would you have any criticisms?
- Does this paper provide us with novel information?
- If the paper is a review paper or a position paper, what stance does the author take? What alternatives might you imagine? Do you think the author supports his/her position well? Why or why not?
- Suggest a way in which this paper relates to other work we have discussed in class or to other research you have read. Are the results consistent with other studies? Do they provide evidence for the primary hypothesis?
- Motivate a hypothesis for a follow-up study based on these results.
- What can this work tell us about auditory cognitive processing more generally? What does it tell us generally about human behavior?

These summaries should be about 1 page, typewritten and printed as a hard copy. Bring them with you to class. Please be sure your name is on the document.

Final Project

You will write a paper on a topic of your own choosing related to the course themes.

- Strive to make this a creative synthesis of some topic of research related to auditory processing from a cognitive neuroscience perspective.
- 12-15 double-spaced pages
- Fully referenced with >10 sources
- Structure your paper in the style of a review article (see *Nature Neuroscience Reviews*, *Trends in Cognitive Sciences*, etc)
- Highlight the major points of debate surrounding the issue

- Note the open questions for future research
- Indicate the ways in which questions are being addressed

Hints on Reading Primary-Source Literature

This course is reading-intensive. Nearly all of this reading will draw from primary sources; that is, they will be journal articles that are "first reports" of significant findings. Other readings are chapters and reviews of primary literature. For some of you, this sort of literature will be quite unfamiliar. It can be a bit difficult to make the transition from reading textbooks to reading primary sources. Here are a few tips:

1. Most importantly, read with a notebook handy. Jot down thoughts and questions and bring them to class. We will spend part of each class clearing up questions. Use these to formulate your Written Summaries.
2. Don't worry if you don't understand some of the terminology. Every field has its own vocabulary. By the end of the semester, you will be a pro. As you read, look up terms and brain areas on the internet to get a deeper understanding.
3. Journal articles are written with the intention that the methods described can be replicated. As you read, stop occasionally and be sure that you really understand what the authors are doing in each experiment. Why did they do X and not Y? Why were certain choices made?
4. Be a critical reader. Don't just passively absorb what the author is arguing. Are the authors' conclusions merited? Do the data really suggest what they claim? What are the broader issues that these experiments attempt to address? Do they do so? If you were going to follow up on this work, what might the next experiment be?

Tips on Leading a Good Discussion

1. When there is more than one discussant for a class period, each of the discussants should take the lead for about half (or, for three discussants, 1/3) of the time.
2. Come prepared with 3 or 4 key topics or issues or conclusions raised in the paper and comments to be raised about each of them. Focus on inferences that we as readers can make, or conclusions that can be drawn, relations to other papers/topics that can be made, etc. Draw on the content of the article to make the point and then relate to other issues in other papers, topics, courses, etc. The main objective of all this thinking is to better understand auditory processing.
3. Be creative. Feel free to create pertinent demonstrations, organize a class debate, etc.
4. Don't feel as though you need to discuss each article in "linear" format (i.e., going straight through one and moving onto another). Try to integrate across *ideas*. What are the common themes? What seem to be the tough questions regarding this subject? What means might we use to try to answer these questions?
5. Your job as discussant is to raise the key issues and help focus the discussion on what you think are the main points to be made about the key issues. However, these main points need not primarily come from you. If things go well, others in the seminar will have generated similar points as well as additional points that you probably didn't think of. Give others every opportunity to contribute to these discussions. It is better (from an instructional point of view) if an important point emerges from a discussion as opposed to being stated. Feel free to re-state or

summarize important points as they emerge, or to make them yourself if they don't emerge.

6. If there are technical questions or issues that you want to raise, go ahead. If there are problems or limitations in the paper, you can raise them. However, don't play "find the flaw" with the papers.
7. Keep summarization to a minimum. You should assume that all members of the seminar have conscientiously done the readings.
8. If you want to make slides to make some point, you can use the projector that is in the room. If you have computer materials to project, you must email them to me before the start of the class period.
9. If you feel that you need some help structuring a discussion, contact me early in the process (i.e., don't wait until Sunday night!)

There is an extensive, rich scientific literature on each of the weekly topics we will discuss. The papers you are assigned to read were chosen from these literatures to pull together some of the important methods, concepts, theoretical arguments, and empirical data regarding auditory cognitive neuroscience. Consider this in reading these assignments. As you read the papers, try to pull together the ideas they present and consider them as a whole. Do the arguments presented in the articles conflict? Are they complementary? What central issues do they address? How do they relate to the "big picture"? How do the data relate to what we have discussed in other sections?

Reappraisal of Grades

A student who feels that a piece of graded term work (e.g., term paper, essay, test) has been unfairly graded, may have the work re-graded as follows. The student shall discuss the work with the instructor within 15 days of being notified about the mark or of the item's return to the class. If not satisfied, the student shall immediately take the matter to the Head of the department offering the course, who will arrange for a reassessment of the work within the next 15 days. The reappraisal of term work may cause the grade to be raised, lowered, or to remain the same. If the student is not satisfied with the decision and wishes to appeal, the student shall address a letter of appeal to the Dean of the faculty offering the course within 15 days of the unfavourable decision. In the letter, the student must clearly and fully state the decision being appealed, the grounds for appeal, and the remedies being sought, along with any special circumstances that warrant an appeal of the reappraisal. The student should include as much written documentation as possible.

Plagiarism and Other Academic Misconduct

Intellectual honesty is the cornerstone of the development and acquisition of knowledge and requires that the contribution of others be acknowledged. Consequently, plagiarism or cheating on any assignment is regarded as an extremely serious academic offense. Plagiarism involves submitting or presenting work in a course as if it were the student's own work done expressly for that particular course when, in fact, it is not. Students should examine sections of the University Calendar that present a Statement of Intellectual honesty and definitions and penalties associated with Plagiarism/Cheating/Other Academic Misconduct.

Academic Accommodation

It is the student's responsibility to request academic accommodations. If you are a student with a documented disability who may require academic accommodation and have not registered with the Disability Resource Centre, please contact their office at 403-220-8237. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation. You are also required to discuss your needs with your instructor no later than 14 days after the start of this course.

Absence From A Test/Exam

Makeup tests/exams are NOT an option without an official University medical excuse (see the University Calendar). A completed Physician/Counselor Statement will be required to confirm absence from a test/exam for health reasons; the student will be required to pay any cost associated with this Statement. Students who miss a test/exam have 48 hours to contact the instructor and to schedule a makeup test/exam. Students who do not schedule a makeup test/exam with the instructor within this 48-hour period forfeit the right to a makeup test/exam. At the instructor's discretion, a makeup test/exam may differ significantly (in form and/or content) from a regularly scheduled test/exam. Except in extenuating circumstances (documented by an official University medical excuse), a makeup test/exam must be written within 2 weeks of the missed test/exam.

Freedom of Information and Protection of Privacy (FOIP) Act

The FOIP legislation disallows the practice of having student's retrieve tests and assignments from a public place. Therefore, tests and assignments may be returned to students during class/lab, or during office hours, or via the Department Office (Admin 275), or will be made available only for viewing during exam review sessions scheduled by the Department. Tests and assignments will be shredded after one year. Instructors should take care to not link students' names or UCIDs with their grades or other FOIP-sensitive information.

Course Credits for Research Participation (Max 2% of final grade)

Students in most psychology courses are eligible to participate in Departmentally approved research and earn credits toward their final grades. **A maximum of two credits (2%) per course**, **including this course, may be applied to the student's final grade. Students earn 0.5% (0.5 credits) for each full 30 minutes of participation.** The demand for timeslots may exceed the supply in a given term. Thus, students are not guaranteed that there will be enough studies available to them to meet their credit requirements. Students should seek studies early in the term and should frequently check for open timeslots. Students can create an account and participate in Departmentally approved research studies at http://ucalgary.sona-systems.com
The last day to participate in studies and to assign or reassign earned credits to courses is **Apr 14th, 2011**

Evacuation Assembly Point

In case of an emergency evacuation during class, students must gather at the designated assembly point nearest to the classroom. The list of assembly points is found at http://www.ucalgary.ca/emergencyplan/assemblypoints
Please check this website and note the nearest assembly point for this course.

Student Organizations

Psychology students may wish to join the Psychology Undergraduate Students' Association (PSYCHS). They are located in Administration 170 and may be contacted at 403-220-5567.

Student Union VP Academic: Phone: 403-220-3911 suvpaca@ucalgary.ca
Student Union Faculty Rep.: Phone: 403-220-3913 socialscirep@su.ucalgary.ca

Student Ombudsman's Office

The Office of the Student Ombuds provides independent, impartial and confidential support for students who require assistance and advice in addressing issues and concerns related to their academic careers. The office can be reached at 403-220-6420 or ombuds@ucalgary.ca (http://www.su.ucalgary.ca/services/student-services/student-rights.html).

Safewalk

The safewalk program provides volunteers to walk students safely to their destination anywhere on campus. This service is free and available 24 hrs/day, 365 days a year.
Call 403-220-5333.

Important Dates

The last day to drop this course with no "W" notation and **still receive a tuition fee refund** is **Jan 21st, 2011**. Last day for registration/change of registration is **Jan 24th, 2011**. The last day to withdraw from this course is **Apr 15th, 2011**.