

The Chinese University of Hong Kong
Department of Linguistics and Modern Languages
First Term, 2023-24

Course title: LING4201 Neurolinguistics

Description: This is an introductory course on neurolinguistics, where you will learn about the connection between language and the brain. Throughout the course, you will recognize brain systems responsible for various language components and research techniques for investigating language processing and representation in the brain. Additionally, we will cover essential research discoveries on the cognitive and neural mechanisms of phonology, semantics, morphology, syntax, and language acquisition.

Content, highlighting fundamental concepts

Topic	Contents/fundamental concepts
Neuroanatomy	Major systems of the brain
Research methods	Lesion and neuroimaging methods
Brain systems that support various language components	Associations between brain systems and various linguistic components
Language acquisition and bilingualism	Brain mechanisms underlying first and second language learning; Neural organization of bilingual brains

Learning outcomes

By the end of this course, students will have the ability to:

- Recognize important structures in the brain, particularly those related to language.
- Comprehend and explain the research methodologies utilized in neurolinguistics research.
- Debate how the brain enables functions of language processing, representation, and production.
- Assess neurolinguistics research studies.

Learning activities

- Lectures
- Use of multimedia materials, e.g., video clips
- Interactive tutorials
- Case studies
- Research articles

Expected time allocation of each of below learning activities during the course (per week):

Lecture (hr) in /out class	Interactive tutorial (hr) in /out class	Lab (hr) in /out class	Discussion of case (hr) in class	Reading (hr) out class	Projects (hr) out class	Web-base d teaching (hr) in /out class	Other (hr) in /out class
2	1		0.2	1	0.2		
M	M		M	O	M		

M: Mandatory activity in the course

O: Optional activity

NA: Not applicable

Assessment scheme

Task nature	Description	Weight
Exams (All cumulative)	Two exams will address knowledge learned in lectures and tutorials. Mid-term exam 20% Final exam 30%	50%
Research Project	Submit a research paper (proposal or literature review) in neurolinguistics on a topic that interests you. Approval from the instructor is required for your chosen topic. Please talk to the instructor for suggestions.	25%
Lab Report	After demonstration of a neuroimaging experiment, students are required to submit a concise report detailing the procedures for collecting behavioral and neural data.	10%
Article Presentation	You will present one research article as a team of two or three (around 10 min) to develop skills in critically analyzing research articles.	10%
Take-home Assignment	A quiz related to neuroanatomy and research method	5%

Learning resources for students

There is no required textbook. This is the list of required readings and more required readings will be announced in class. All readings and assignments are posted on Blackboard (<https://blackboard.cuhk.edu.hk>).

Week 1 and 2: Course Overview and Neuroanatomy

- YouTube video: Steven Pinker: Linguistics as a Window to Understanding the Brain | Big Think (https://www.youtube.com/watch?v=Q-B_ONJIEcE)
- Fuller et al. (2012). Anatomy and Physiology of the Nervous System (Chapter 4). Applied Anatomy and Physiology for Speech-Language Pathology and Audiology.
- Kemmerer D. (2014). Cognitive Neuroscience of Language (Part I). *Psychology Press*, New York.

Week 3 and 4: Research Methods

- Gazzaniga et al. (2002). The Methods of Cognitive Neuroscience (Chapter 4). *Cognitive Neuroscience: The Biology of the Mind*.
- Rorden, C. & Karnath, H-O. 2004. Using human brain lesions to infer function: a relic from a past era in the fMRI age? *Nat Rev Neurosci*, 5, 813-819.
- Steven J. Luck. (2014). An Introduction to the Event-Related Potential Technique, Second Edition, Massachusetts: The MIT Press.
- Almajidy, R. K., Mankodiya, K., Abtahi, M., & Hofmann, U. G. (2019). A newcomer's guide to functional near infrared spectroscopy experiments. *IEEE Reviews in Biomedical Engineering*, 13, 292-308.
- Czeszumski, A., Eustergerling, S., Lang, A., Menrath, D., Gerstenberger, M., Schuberth, S., ... & König, P. (2020). Hyperscanning: a valid method to study neural inter-brain underpinnings of social interaction. *Frontiers in Human Neuroscience*, 14, 39.

Week 6: Phonology

- Hickok G, Poeppel D. 2007. The cortical organization of speech processing. *Nat Rev Neurosci* 8:393-402.
- Monahan, P. J., Lau, E. F., & Idsardi, W. J. (2013). Computational primitives in phonology and their neural correlates. *The Cambridge Handbook of Biolinguistics*, 233-256.
- Kemmerer D. (2014). Cognitive Neuroscience of Language (Part III). *Psychology Press*, New York.
- Gregory Hickok & David Poeppel. (2015). Neural Basis of Speech Perception. In the Gregory Hickok & Steven L. S mall (edt). *Neurobiology of Language*. Academic Press.

Week 7-9: Reading, Semantics & the Lexicon

- Kemmerer D. (2014). Cognitive Neuroscience of Language (Part IV). *Psychology Press*, New York.
- Kutas, M. and Federmeier, K.D. (2000). Electrophysiology reveals semantic memory use in language comprehension. *Trends in Cognitive Sciences*, 4, 463-470.
- Ullman, M. T. (2001). A neurocognitive perspective on language: The declarative procedural model. *Nature reviews Neuroscience*, 2, 719-726.
- Lau EF, Phillips C, Poeppel D. 2008. A cortical network for semantics: (de)constructing the N400. *Nat Rev Neurosci*. 9:920-933.

Week 10&11: Morphology & Syntax

- Stromswold, K., Caplan, D., Alpert, N. & Rauch, S. (1996). Localization of syntactic comprehension by positron emission tomography. *Brain and Language*, 52 (3), 452-473.
- Just, M.A., Carpenter, P.A., Keller, T.A., Eddy, W.F., and Thulborn. (1996). Brain activation modulated by sentence comprehension. *Science*, 274, 114-116.

Week 12-14: Language Acquisition & Bilingualism

- Kuhl, P. K. & Rivera-Gaxiola, M. (2008). Neural substrates of language acquisition. *Annual Review of Neuroscience*. 31, 511-534.
- Kuhl PK. 2010. Brain mechanisms in early language acquisition. *Neuron* 67:713-727.
- Krishnan S, Watkins KE, Bishop DV. 2016. Neurobiological Basis of Language Learning Difficulties. *Trends Cogn Sci*. 20:701-714.
- Costa A, Sebastian-Galles N. 2014. How does the bilingual experience sculpt the brain? *Nat Rev Neurosci* 15:336-345.
- Kim et al. (1997). Distinct cortical areas associated with native and second languages. *Nature*, 388, 171-4.

Feedback for evaluation

Students are welcome to give comments and feedback by sending them in written form to the instructor or TA's email address or talking to them individually.

Grade Descriptors

Grade	LING 4201 Neurolinguistics
A	Demonstration of a thorough understanding of the neurological bases of language across structural components and input/output modalities with virtually no weakness, including the ability to 1) describe the brain circuits associated with language, 2) defend the appropriateness of using specific brain methods to investigate questions about language, 3) integrate knowledge about linguistic theory with models of brain processing, 4) explain how crosslinguistic differences may or may not lead to differences in neural responses, 5) identify areas of future research opportunities through a review of the current literature in neurolinguistics.
A-	Demonstration of a thorough understanding of the neurological bases of language across structural components and input/output modalities with only minor weaknesses, including the ability to 1) describe the brain circuits associated with language, 2) defend the appropriateness of using specific brain methods to investigate questions about language, 3) integrate knowledge about linguistic theory with models of brain processing, 4) explain how crosslinguistic differences may or may not lead to differences in neural responses, 5) identify areas of future research opportunities through a review of the current literature in neurolinguistics.
B	Demonstration of a thorough understanding of the neurological bases of language across structural components and input/output modalities with weaknesses in no more than one major component of language. Evidence of a thorough understanding may include the ability to 1) describe the brain circuits associated with language, 2) defend the appropriateness of using specific brain methods to investigate questions about language, 3) integrate knowledge about

	linguistic theory with models of brain processing, 4) explain how cross-linguistic differences may or may not lead to differences in neural responses, 5) identify areas of future research opportunities through a review of the current literature in neurolinguistics.
C	Demonstration of an understanding of the neurological bases of language across structural components and input/output modalities with weaknesses in more than one major component of language.
D	Demonstration of some understanding of the neurological bases of language across structural components and input/output modalities with weaknesses in several major components of language.
F	Demonstration of minimal understanding of the neurological bases of language across structural components and input/output modalities with significant weaknesses in many components of language.

Course Schedule

Week	Date	Lecture	Tutorial
Week 1	Sep. 4	Introduction to Neurolinguistics	Lab visit
Week 2	Sep. 11	Neuroanatomy and Language System	Hands-on neuroimaging data visualization Brain structures identification
Week 3	Sep. 18	Research Methods I	Neuroimaging data tour Case study discussion
Week 4	Sep. 25	Research Methods II	fNIRS Exp/Lab intro & brief demo
Week 5	Oct. 2	Holiday	
Week 6	Oct. 9	Phonology and the Brain	Phonology Research Project Discussion
Week 7	Oct. 16	Reading and the Brain	Reading paradigms introduction
Week 8	Oct. 23	Holiday	
Week 9	Oct. 30	Semantics & Lexicon	Mid-Term Exam (1 hour)
Week 10	Nov. 6	Morphology & Syntax	Semantics & the Lexicon Morphology & Syntax
Week 11	Nov. 13	Sentence comprehension	Article Presentation
Week 12	Nov. 20	First Language Acquisition	Article Presentation
Week 13	Nov. 27	Second Language Acquisition	Article Presentation
Week 14	Dec. 04	Bilingual Brain	Final Exam (1.5 hours)

Teacher's and TA's contact details

Professor/Lecturer/Instructor:	
Name:	FENG Gangyi
Office Location:	Room G09, Leung Kau Kui Building
Office Hours:	Thursday 16:30-18:00 (at KKB) or by appt Communication languages: English, Cantonese (native), Mandarin (native)
Telephone:	3943-3190

Email:	g.feng@cuhk.edu.hk
Teaching Venue:	LSK 301
Class/Tutorial Time:	Monday 13:30-16:15
Website:	https://www.researchgate.net/profile/Gangyi-Feng Google Scholar: Gangyi Feng

	Teaching Assistant
Name:	TBD
Office Location:	
Office Hours:	
Telephone:	
Email:	
Website:	

A facility for posting course announcements

All teaching materials will be uploaded (either before or after lecture) onto Blackboard <https://blackboard.cuhk.edu.hk>) or via email.

Academic honesty and plagiarism

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at http://www.cuhk.edu.hk/policy/academic_honesty/. With each assignment, students will be required to submit a statement that they are aware of these policies, regulations, guidelines and procedures.

For each written assignment, students are required to submit a signed [declaration](#) that they are aware of these policies, regulations, guidelines and procedures. For group projects, all students of the same group should be asked to sign on the declaration.

For assignments/papers in the form of a computer-generated document that is principally text-based and submitted via VeriGuide, the statement, in the form of a receipt, will be issued by the system upon students' uploading of the soft copy of the assignment. Assignments without the receipt will not be graded by teachers. Only the final version of the assignment should be submitted via VeriGuide.