

**The Chinese University of Hong Kong**  
**Department of Linguistics and Modern Languages**  
**Second Term, 2025-26**

**Course Title:** LING4201 Neurolinguistics

**Description:** This introductory course explores the fascinating relationship between language and the brain. You will examine the brain systems involved in different aspects of language and learn about research methods used to study how language is processed and represented in the brain. The course will also review key research findings on the cognitive and neural mechanisms behind phonology, semantics, morphology, syntax, and language learning.

**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 involved in learning first and second languages; Neural organization of bilinguals

**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 the knowledge learned in lectures and tutorials. Mid-term exam 20% Final exam 25%	45%
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 a demonstration of a neuroimaging (EEG or fNIRS) experiment, students are required to submit a brief report outlining the procedures for collecting behavioral and neural data.	15%
Group 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 and clearly presenting research findings.	10%
Take-home Assignment	A quiz related to neuroanatomy and research methods	5%

### Learning resources

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 & 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](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 4 & 5: 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. Small (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 Learning & 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 Schedules

Week	Date	Lecture	Tutorial
Week 1	Jan 07	Introduction to Neurolinguistics	Lab visit (Department Lab and BMI)
Week 2	Jan 14	Language, Cognition and the Brain	Language Sciences Paradigms
Week 3	Jan 21	Neuroanatomy and Language System	Hands-on brain visualization and structures identification
Week 4	Jan 28	Research Methods I	Brain structures, functions, and neuroimaging
Week 5	Feb 04	Research Methods II	fNIRS Exp brief intro & demo
Week 6	Feb 11	Phonology and the Brain	Phonology & Reading Paradigms
Week 7	Feb 18	<i>Holiday</i>	
Week 8	Feb 25	Reading and the Brain	Mid-Term Exam (1.5 hours)
Week 9	Mar 04	<i>Reading week (no class)</i>	
Week 10	Mar 11	Semantic representations in the brain	Introduction to ERP Components Related to Semantic and Syntactic Processes
Week 11	Mar 18	Morphology & Syntax	Article Presentation
Week 12	Mar 25	Sentence comprehension	Article Presentation
Week 13	Apr 01	Language Learning and Acquisition (I)	Hyperscanning Experiment Demo Article Presentation
Week 14	Apr 08	Language Learning and Acquisition (II)	Article Presentation
Week 15	Apr 15	Bilingual Brain	Final Exam (1.5 hours)

### Teacher's and TA's contact details

<b>Professor/Lecturer/Instructor:</b>	
Name:	FENG Gangyi
Office Location:	Room G09, Leung Kau Kui Building
Office Hours:	Friday 15:30-17:00 (at KKB) or by appt Communication languages: English, Cantonese (native), Mandarin (native)

Telephone:	3943-3190
Email:	<a href="mailto:g.feng@cuhk.edu.hk">g.feng@cuhk.edu.hk</a>
Teaching Venue:	LSK 302
Class/Tutorial Time:	Wed 14:30-17:15
Website:	Lab website: <a href="https://neurolanglab.github.io/index.html">https://neurolanglab.github.io/index.html</a> Google Scholar: Gangyi Feng

<b>Teaching Assistant</b>	
Name:	CUI Zhenjiang YANG Mingchuan
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Website:	

#### A facility for posting course announcements

All course announcements will be posted on Blackboard (<https://blackboard.cuhk.edu.hk>).

#### 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/academichonesty/>.

With each assignment, students will be required to submit a signed **declaration** that they are aware of these policies, regulations, guidelines and procedures.

- In the case of group projects, all members of the group should be asked to sign the declaration, each of whom is responsible and liable to disciplinary actions, irrespective of whether he/she has signed the declaration and whether he/she has contributed, directly or indirectly, to the problematic contents.
- For assignments 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.
- Students are fully aware that their work may be investigated by AI content detection software to determine originality.
- Students are fully aware of the AI approach(es) adopted in the course. In the case where some AI tools are allowed, students have made proper acknowledgment and citations as suggested by the course teacher.

Assignments without a properly signed declaration will not be graded by teachers.

Only the final version of the assignment should be submitted via VeriGuide.

The submission of a piece of work, or a part of a piece of work, for more than one purpose (e.g. to satisfy the requirements in two different courses) without declaration to this effect shall be regarded as having committed undeclared multiple submissions. It is common and acceptable to reuse a turn of phrase or a sentence or two from one's own work; but wholesale reuse is problematic. In any case, agreement from the

course teacher(s) concerned should be obtained prior to the submission of the piece of work.

The copyright of the teaching materials, including lecture notes, assignments and examination questions, etc., produced by staff members/ teachers of The Chinese University of Hong Kong (CUHK) belongs to CUHK. Students may download the teaching materials produced by the staff members/ teachers from the Learning Management Systems, e.g. Blackboard, adopted by CUHK for their own educational use, but shall not distribute/ share/ copy the materials to a third-party without seeking prior permission from the staff members/ teachers concerned.

#### **Use of AI tools for grading and provision of feedback on student work**

AI tools supported by the university may be used to grade and provide feedback on some assignments and assessment tasks. Their use will depend on the nature of the assignments and assessments.

#### **Use of generative AI tools**

The use of AI tools is prohibited for mid-term and final exams.

The use of AI tools is allowed with explicit acknowledgment and proper citation for assignments.

The type of AI tools permitted:

The type can be implemented in various forms. These AI tools involve conducting related surveys and research, which is permitted, e.g., data collection, analysis, and model building.

The extent of their use:

Activities related to research that do not directly involve generating the writing of research papers, assignments, or manuscripts are permitted. Allowed AI-related research activities include testing LLM models, comparing ChatGPT with humans, using machine learning or neural network algorithms to analyze data, AI-assisted programming, developing computational models, and more.

#### **Guideline on Sharing Lecture Recordings**

The make-up class and any online lecture will be recorded and shared on the university's online learning platform.