**The Chinese University of Hong Kong**
**Department of Linguistics and Modern Languages**
**Second Term, 2024-25**

**Course Code:** LING6953
**Title in English:** Topics in Neurolinguistics & Psycholinguistics—Fundamentals of Neurolinguistics
**Title in Chinese:** 神經語言學與心理語言學專題─神經語言學基礎

**Description:** This course introduces students to selected topics concerning the neurobiology of language as well as language representation, processing, and production. You will explore the brain systems responsible for various components of language and learn about the experimental design and research techniques used to investigate language processing and representation in the brain and mind. The course will cover essential research findings on the cognitive and neural mechanisms underlying phonology, semantics, morphology, syntax, and language acquisition. Major theoretical debates and contemporary issues addressing different aspects of language will be discussed.

**Learning outcomes**

At the end of the course, students will be able to
● Describe and apply research methods in psycholinguistics and neurolinguistics research
● Identify major structures and systems in the brain, especially those that are relevant to language
● Discuss how the brain enables language representation, processing, and production functions
● Analyze research studies in psycholinguistics and neurolinguistics

**Course syllabus**

| Topic | Contents/fundamental concepts |
| --- | --- |
| Neuroanatomy | Major systems in the brain |
| Neurolinguistics as an empirical science | Describe aims of neurolinguistics; empirical research design, neuroscientific methods, hypothesis testing |
| Research methods | Lesion and neuroimaging methods, EEG, fMRI |
| Language components in the brain | Associations between brain systems and language structures |
| Language acquisition and the brain | Neural consequences of first and second language acquisition |

**Course components (Teaching modes and Learning activities)**

| Teaching Modes and Learning Activities | |
| --- | --- |
| **On-site face-to-face** (hybrid or online modes may be available in extreme conditions) | Percentage of time 100% |
| *Lectures* | 70-100% (2 hours/week) |
| *Interactive tutorial* | 0-30% (0.75 hour/week) |
| *or Laboratory activities* | 0-30% (0.75 hour/week) |
| *or Discussion of case* | 0-30% (0.75 hour/week) |
| **Out-of-classroom** | Percentage of time 100% |
| *Self study* | 50% (1 hours/week) |
| *Project work* | 50% (1 hour/week) |

**Assessment type, percentage, and rubrics**

| Task nature | Description | Weight |
|---|---|---|
| Mid-term and Final Exams | Mid-term and final exams will comprehensively assess the didactic information presented in the lectures.<br>Mid-term: 10%<br>Final: 15% | 25% |
| Reaction Papers | A two-page (single-spaced) critical evaluation of published journal articles outside the student's primary area of interest. This may involve a critical analysis of specific aspects of the readings and can include other sources. Options for evaluation might include identifying and explaining contradictions in the literature, integrating various points from the readings, or taking a stance on a controversial issue. | 10% |
| Advanced Topics Presentation | Presentation of a topic within the student's area of interest. (instructions uploaded separately) | 25% |
| Final Research Proposal | Proposal of a research study (instructions uploaded separately) | 35% |
| Short Assignments | Short assignments will be administered to promote interactive learning in lectures. | 5% |

**Learning resources for students**

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

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.
- Penke, M., & Rosenbach, A. (2007). What counts as evidence in linguistics? An introduction. In M. Penke & A. Rosenbach (eds). *What Counts as Evidence in Linguistics.* John Benjamins Publishing Group: Amsterdam.
- Peirce, C. S. (1877). The fixation of belief. *Popular Science Monthly*, 1-15. http://www.peirce.org/writings/p107.html

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.
- Embick, D. & Poeppel D. (2015). Towards a computational(list) neurobiology of language: correlational, integrated and explanatory neurolinguistics. *Language, Cognition and Neuroscience*, 30, 357-366.
- Chomsky, N. (1965). Methodological Preliminaries (Chapter 1). *Aspects of the Theory of Syntax*. MIT Press.

Advanced Topics for each language component
- Hickok, G. & Poeppel, D. (2007). The cortical organization of speech processing. *Nature Reviews Neuroscience,* 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.
- Leinenger, M., 2014. Phonological coding during reading. Psychological Bulletin 140, 1534-1555.
- Ullman, M. T. (2001). A neurocognitive perspective on language: The declarative procedural model. *Nature reviews –Neuroscience, 2,* 719-726.
- Kutas, M. and Federmeier, K.D. (2000). Electrophysiology reveals semantic memory use in language comprehension. *Trends in Cognitive Sciences, 4*, 463-470.
- Kuhl, P. K. & Rivera-Gaxiola, M. (2008). Neural substrates of language acquisition. *Anuual Review of Neuroscience*. 31, 511-534.
- Kim et al. (1997). Distinct cortical areas associated with native and second languages. *Nature, 388,* 171-4.
- Morgan-Short, K. (2019).  Insights into the neural mechanisms of becoming bilingual: A brief synthesis of second language research with artificial linguistic systems.  *Bilingualism: Language and Cognition,* 23, 87-91.
- 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.
- 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.

**Feedback for evaluation**

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

**Course Schedule**

| Class/ week | Date | Topics and requirements |
|---|---|---|
| Week 1 | Jan 08 | Philosophy of Science & Basic Scientific Concepts |
| Week 2 | Jan 15 | Functional Neuroanatomy & Methods of Neurolinguistics |
| Week 3 | Jan 22 | Research Methods & Explanatory Neurolinguistics I |
| Week 4 | Jan 29 | *Chinese New Year* |
| Week 5 | Feb 05 | Research Methods & Explanatory Neurolinguistics II |
| Week 6 | Feb 12 | Phonetics/Phonology Fundamentals |
| Week 7 | Feb 19 | Reading/Semantics Fundamentals |
| Week 8 | Feb 26 | Morphology/Syntax Fundamentals & *Mid-term* |
| Week 9 | March 05 | *Reading Week* |
| Week 10 | March 12 | Advanced Topics in Language Comprehension & Syntax |
| Week 11 | March 19 | Advanced Topics in Communication and Neural Synchronization |

| Week 12 | March 26 | MRI/EEG/fNIRS Facility Tour & Hyperscanning Experiment Demo |
| Week 13 | April 02 | Advanced Topics in First Language Acquisition |
| Week 14 | April 09 | Advanced Topics in Second Language Learning and Bilingualism |
| Week 15 | April 16 | Neuroimaging Experimental Design Logic & *Final Exam* |

**Grade Descriptors**

| Grade | Overall Course |
|---|---|
| A | Demonstration of a thorough understanding of the psychological and/or 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 experimental methods to investigate questions about language, 3) integrate knowledge about linguistic theory with models of psychological and brain processing, 4) explain how cross-linguistic differences may or may not lead to differences in psychological and neural responses, 5) identify areas of future research opportunities through a review of the current literature in neurolinguistics and/or psycholinguistics. |
| A- | Demonstration of a thorough understanding of the psychological and/or 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 experimental methods to investigate questions about language, 3) integrate knowledge about linguistic theory with models of psychological and brain processing, 4) explain how cross-linguistic differences may or may not lead to differences in psychological and neural responses, 5) identify areas of future research opportunities through a review of the current literature in neurolinguistics and/or psycholinguistics. |
| B | Demonstration of a thorough understanding of the psychological and/or 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 experimental methods to investigate questions about language, 3) integrate knowledge about linguistic theory with models of psychological and brain processing, 4) explain how cross-linguistic differences may or may not lead to differences in psychological and neural responses, 5) identify areas of future research opportunities through a review of the current literature in neurolinguistics and/or psycholinguistics. |
| C | Demonstration of an understanding of the psychological and/or 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 psychological and/or 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 psychological and/or neurological bases of language across structural components and input/output modalities with significant weaknesses in many components of language. |

**Contact details for teacher(s) or TA(s)**

| Professor/Lecturer/Instructor: | Prof. |
|---|---|
| Name: | FENG Gangyi |
| Office Location: | G09 KKB (or 401 4/F HYS) |
| Office Hours: | Thursday 15:30-17:00 or by appt<br>English, Cantonese (native), Mandarin (native) |

| Telephone: | 3943-3190 |
|---|---|
| Email: | g.feng@cuhk.edu.hk |
| Teaching Venue: | Yasumoto International Academic Park (YIA) LT7 |
| Class/Tutorial Time: | Wed 09:30-12:15 |
| Website: | https://neurolanglab.github.io/index.html |
| Other information: | Google Scholar: Gangyi Feng (冯刚毅) |

**Details of course website**

All announcements of the course 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.

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**Use of generative AI tools**

The use of AI tools is allowed with explicit acknowledgment and proper citation for assignments.
The use of AI tools is prohibited for mid-term and final exams.