

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

<p>Course Code: LING4202 Title in English: Special Topics in Language and Mind — Paradigms in Language Sciences Title in Chinese: 語言與心智專題 – 語言科學研究範式</p>
<p>Course description: This course introduces students to the paradigms and research methods used in language sciences. Students will learn about various empirical and experimental approaches in psycholinguistics and neurolinguistics, including popular behavioral paradigms such as grammaticality judgment, rating assessment, priming, visual world eye tracking, and neuroimaging techniques like Electroencephalogram (EEG) and functional near-infrared spectroscopy (fNIRS). We will also explore cutting-edge large language models like GPT and how these models can support language research. Through examples of behavioral and neuroimaging studies, students will understand how these paradigms and techniques can address key questions about language and the mind. Students will also study research ethics, design, planning, and implementation, and will have the opportunity to conduct classic behavioral and neuroimaging experiments related to language processes, such as semantic and syntactic processing. This course is appropriate for senior undergraduate and junior graduate students at various stages of their studies. It aims to equip students with the skills and strategies needed to understand and conduct empirical language research.</p>

<p>Learning outcomes: At the end of the course, students will</p> <ul style="list-style-type: none"> ● have a basic understanding of research designs and methods in language sciences. ● describe the pros and cons of classic empirical research paradigms. ● have a better understanding of how to measure appropriate variables and collect reliable data for empirical research. ● understand the logic of classic behavioral experimental paradigms. ● accurately describe behavioral and neuroimaging methods used in language research. ● understand the basic principle of neuroimaging (EEG and fNIRS) signals and the recording procedures. ● understand basic statistical approaches and the practical skills to apply them to actual data. ● write lab reports to describe the methods and results of a behavioral/EEG/fNIRS experiment.

Course syllabus

Topic	Contents/fundamental concepts
Language sciences as an empirical science	Aims of language sciences, essential empirical research background, scientific approaches, hypothesis testing, etc.
Overview of experimental methods in language sciences	Quantitative approaches and research design: within/between-subject design, correlational design, cause-and-effect design, cross-sectional and longitudinal design, basic stat, etc.
Offline and online paradigms used in experimental linguistics	Introducing classic behavioral paradigms (e.g., grammaticality judgment, priming, visual world for eye tracking experiments)
Experiment implementation and crowdsourcing platforms	Programming basics in the Qualtrics platform or E-Prime software to implement experiments
EEG and fNIRS basics	The nature of EEG and fNIRS signals; examples of language-related ERP components (e.g., N400 and P600) and fNIRS activations
EEG/fNIRS experimental design	Introduce examples of EEG/fNIRS studies and explain how they can

EEG/fNIRS data recording	answer key questions about language and the mind. Basic recording procedure for typical EEG/fNIRS experiments. Students can use the EEG/fNIRS machine in our lab to collect data for classic experiments.
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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%
<i>Lectures</i>	70% (2 hours/week)
<i>Interactive tutorial</i>	30% (0.75 hour/week)
<i>or Laboratory activities</i>	30% (0.75 hour/week)
<i>or Discussion of case</i>	30% (0.75 hour/week)
Out-of-classroom	Percentage of time 100%
<i>Self study</i>	66% (2 hours/week)
<i>Project work</i>	17% (0.5 hour/week)
<i>Lab work</i>	17% (0.5 hour/week)

Assessment type, percentage, and rubrics

Assessment type	Description	Percentage
Mid-term and Final Exams	Mid-term and final exams will assess the didactic information presented in the lectures. Mid-term: 15% Final: 20%	35%
Behavioral or neuroimaging (EEG/fNIRS) experimental report	Submit an experimental report on behavioral or neuroimaging (EEG or fNIRS) recording, data analysis, and visualization. Students should explain the experiment's rationale, recording procedure, analysis pipeline, results, and how the data is visualized.	15%
Research presentation (group assignment)	Students (2-3 in a group) are required to present a research paper on a specific paradigm that interests them.	15%
Research Proposal or Review Paper	Design a logical experiment for language sciences research or conduct a literature review on a specific topic, using EEG/fNIRS or behavioral measures.	30%
Short Assignments	Short assignments (Human vs. LLMs on GJT or other rating assessments) will be administered to promote interactive learning.	5%

Required and recommended readings

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

Week 1

- * 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.
- * Goodwin, C.J. (2013). *Research in Psychology: Methods and Designs*. Wiley: NJ. [Chapters 1 and 3]
- Peirce, C. S. (1877). The fixation of belief. *Popular Science Monthly*, 1-15.
<http://www.peirce.org/writings/p107.html>
- Drost, E. A. (2011). Validity and reliability in social science research. *Education Research and Perspective*, 38, 105–123.

Week 2-3

- * The grammaticality judgment task. Blume, María; Lust, Barbara; Chien, Yuchin (Col); Dye, Cristina D. (Col); Foley, Claire A. (Col) & Kedar, Yarden (Col). (2017). *Research methods in language acquisition: Principles, procedures, and practices*.(pp. 155-163). Washington, DC, US: American Psychological Association, ix, 313 pp.
- Schmid MS. Grammaticality judgment tasks. In: *Language Attrition. Key Topics in Sociolinguistics*. Cambridge University Press; 2011:151-170.
- * Gibson, E. and Fedorenko, E. (2010) Weak quantitative standards in linguistics research. *Trends Cogn. Sci.* 14, 233–234
- Gibson, E., Pearlmutter, N., Canseco-Gonzalez, E., & Hickok, G. (1996). Recency preference in the human sentence processing mechanism. *Cognition*, 59(1), 23-59.

Week 4

- * Abbuhl, R., Gass, S., & Mackey, A. (2013). Experimental research design. Chapter 7, In R. J. Podesva & D. Sharma (eds). *Research Methods in Linguistics*. Cambridge University Press: NY.
- Eckert, P. (2013). Ethics in linguistic research. In R. J. Podesva & D. Sharma (eds). *Research Methods in Linguistics*. Cambridge University Press: NY.

Week 5 and 7

- * Kaiser, E. (2013). Experimental paradigms in psycholinguistics. In R. J. Podesva & D. Sharma (eds). *Research Methods in Linguistics*. Cambridge University Press: NY.
- Saffran, J.R., Newport, E.L., & Aslin, R. N. (1996). Word segmentation: the role of distributional cues. *Journal of Memory and Language*. 35, 606-621.
- Spivey, M.J., Grosjean, M., & Knoblich, G. (2005). Continuous attraction toward phonological competitors. *PNAS*. 102, 10393-10398.
- Spivey, M.J. & Marian, V. Cross talk between native and second languages: partial activation of an irrelevant lexicon. *Psych Science*. 10, 281-284.
- * Spapé, M., Verdonschot, R., & Van Steenbergen, H. (2020). *The E-Primer: An introduction to creating psychological experiments in E-Prime*. Leiden University Press.
- P.C. Gomez (2013). *Statistical Methods in Language and Linguistic Research*. Equinox: CT. [Chapters 1-3]

Week 9-13

- Gazzaniga et al. (2002). *The Methods of Cognitive Neuroscience (Chapter 4)*. *Cognitive Neuroscience: The Biology of the Mind*.
- * Kemmerer D. 2014. *Cognitive Neuroscience of Language: Psychology Press. (PART I)*
- * Kutas M. and Federmeier K.D. (2000). Electrophysiology reveals semantic memory use in language comprehension. *Trends in Cognitive Sciences*, 4, 463-470.
- * Embick, D. & Poeppel, D. (2015). *Towards a computational(list) neurobiology of language:*

correlational, integrated and explanatory neurolinguistics. *Language, Cognition and Neuroscience*, 30, 357-366.

- * Luck, S. J. (2014). An introduction to the event-related potential technique. MIT Press.
- Steven J. Luck. Applied Event-Related Potential Data Analysis, 2022, LibreTexts: [https://socialsci.libretexts.org/Bookshelves/Psychology/Book%3A_Applied_Event-Related_Potential_Data_Analysis_\(Luck\)](https://socialsci.libretexts.org/Bookshelves/Psychology/Book%3A_Applied_Event-Related_Potential_Data_Analysis_(Luck))
- Luck, S. J., & Kappenman, E. S. (Eds.). (2011). The Oxford handbook of event-related potential components. Oxford university press.
- Verma, Siddhartha. Matlab for Newbies: The Bare Essentials. (This book will guide your first steps in programming in Matlab) <http://fau.digital.flvc.org/islandora/object/fau%3A41899>
- Sizemore, J., & Mueller, J. P. (2014). MATLAB for Dummies. John Wiley & Sons.
- Install Matlab with CUHK license following this guideline: <https://www.itsc.cuhk.edu.hk/tc/all-it/procurement-support/campus-wide-software/matlab-and-simulink/>

Week 14

- Tak, S., Ye, J.C., 2014. Statistical analysis of fNIRS data: A comprehensive review. *Neuroimage* 85, 72-91.
- 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.
- Steinbrink, J., Villringer, A., Kempf, F., Haux, D., Boden, S., & Obrig, H. (2006). Illuminating the BOLD signal: combined fMRI–fNIRS studies. *Magnetic resonance imaging*, 24(4), 495-505.
- * 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.
- * Cui, X., Bryant, D. M., & Reiss, A. L. (2012). NIRS-based hyperscanning reveals increased interpersonal coherence in superior frontal cortex during cooperation. *Neuroimage*, 59(3), 2430-2437.

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.

Grade Descriptors

Grade	Overall Course
A	Demonstration of a thorough understanding of experimental designs and methods in experimental linguistics with virtually no weakness, including the ability to 1) describe behavioral and neuroimaging methods used in experimental linguistic research, 2) describe the pros and cons of the mainstream approaches, 3) understand the logic of classic behavioral experimental design, 4) understand how to devise and measure appropriate variables, 5) understand the basic principle of EEG/fNIRS signals and the recording procedures, 6) understand basic statistical approaches, 7) write lab reports to describe the methods and results of a behavioral/EEG/fNIRS experiment.
A-	Demonstration of a thorough understanding of experimental designs and methods in experimental linguistics with only minor weaknesses, including the ability to 1) describe behavioral and neuroimaging methods used in experimental linguistic research, 2) describe the pros and cons of the mainstream approaches, 3) understand the logic of classic behavioral experimental design, 4) understand how to devise and measure appropriate variables, 5) understand the basic principle of EEG/fNIRS signals and the recording procedures, 6) understand basic statistical approaches, 7) write lab reports to describe the methods and results

	of a behavioral/EEG/fNIRS experiment.
B	Demonstration of a thorough understanding of experimental designs and methods in experimental linguistics with weaknesses in no more than one major component of the course. Evidence of a thorough understanding may include the ability to 1) describe behavioral and neuroimaging methods used in experimental linguistic research, 2) describe the pros and cons of the mainstream approaches, 3) understand the logic of classic behavioral experimental design, 4) understand how to devise and measure appropriate variables, 5) understand the basic principle of EEG/fNIRS signals and the recording procedures, 6) understand basic statistical approaches, 7) write lab reports to describe the methods and results of a behavioral/EEG/fNIRS experiment.
C	Demonstration of an understanding of experimental designs and methods in experimental linguistics with a few weaknesses
D	Demonstration of some understanding of experimental designs and methods in experimental linguistics with weaknesses in several major components.
F	Demonstration of a minimal understanding of experimental designs and methods in experimental linguistics with significant weaknesses in many components.

Course Schedule

Class/ week	Date	Topics and requirements
Week 1	Sep 03	Overview of paradigms in language sciences (e.g., experimental methods and core research concepts: hypothesis testing, prediction, assumption, falsifiability, validity, reliability, etc.) (Lab tour @ Department of Linguistics and Modern Languages; LKK)
Week 2	Sep 10	Conventional offline approaches: grammaticality judgment task (GJT) and other rating assessments (Assignment: Human vs. ChatGPT on GJT performance) (Lab tour @ Brain and Mind Institute, eye-tracking, EEG, and fNIRS labs; HYS and WFY)
Week 3	Sep 17	Online processing approaches: reaction time measures, self-paced reading, mouse tracking, and eye tracking (Lab: Introduction to Qualtrics/E-Prime)
Week 4	Sep 24	Introduction to Research Design I (within- vs. between-subject design, cross-sectional vs. longitudinal design, etc.) (Lab: Qualtrics programming & hands-on practices: building a questionnaire)
Week 5	Oct 01	<i>Holiday</i>
Week 6	Oct 08	Introduction to Research Design II (Lab: Qualtrics programming & hands-on practices: building an experiment)
Week 7	Oct 15	Language and Cognition I (Cognitive processes of language) (Lab: learn to use Qualtrics with a semantic priming experiment)
Week 8	Oct 22	Language and Cognition II
Week 9	Oct 29	<i>Holiday</i>
	Oct 31	(Make-up class) Mid-Term Exam & Overview of Neurolinguistic approaches and paradigms

Week 10	Nov 05	Introduction to Neurolinguistic approaches and paradigms (Lab: Introduction to fNIRS recording procedure)
Week 11	Nov 12	Neurophysiological paradigms: EEG basics and ERP components & Optical neuroimaging paradigms: fNIRS basic and signals (Research article presentation)
Week 12	Nov 19	EEG/fNIRS experiments in the lab (demo with a classic experiment) (Research article presentation)
Week 13	Nov 26	Hyperscanning paradigms: communication, interaction, language learning and teaching (Lab: fNIRS hyperscanning demo) (Research article presentation)
Week 14	Dec 02	(Make-up class) Research article presentation & Final Exam

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:	Friday 15:30-17:00 or by appt English, Cantonese (native), Mandarin (native)
Telephone:	3943-3190
Email:	g.feng@cuhk.edu.hk
Teaching Venue:	Lady Shaw Building (LSB) LT4
Class/Tutorial Time:	Wed 14:30-16:15 (Lecture), 16:30 – 17:15 (Tutorial)
Website:	NLL Lab website: https://neurolanglab.github.io/index.html
Other information:	Google Scholar: Gangyi Feng (冯刚毅)

Teaching Assistant/Tutor:	TA
Name:	CUI Zhenjiang YANG Mingchuan
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Teaching Venue:	Lady Shaw Building (LSB) LT4
Other information:	

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.

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, building models, etc.

The extent of their use:

Activities related to research that do not directly involve generating research papers, assignments, or

manuscripts are permitted. Allowed AI-related research activities includes testing LLM models, comparing ChatGPT with humans, using machine learning or neural network algorithms to analyze data, AI-assisted programming, developing predictive models, and more.