Course Code	HP4273
Course Title	Introduction to Functional Neuroimaging
Pre-requisites	HP1000 Introduction to Psychology, HP1100 Fundamentals of Social Science Research, and **Either** HP2200 Biological Psychology **or** BS3001 Neurobiology
No of AUs	4 AUs

Course Aims

Neuroimaging is a set of techniques that enable us to image the structure, function/pharmacological effects of the nervous system. This is an interdisciplinary domain that has its roots in psychology, neuroscience and biomedical engineering, and has important bearings in advancing psychology as an interdisciplinary science. The purpose of the lecture is to introduce you to the fast growing field of neuroimaging as an advanced technique to study brain functions. The course will mainly focus on introducing functional magnetic resonance imaging (fMRI) as a measurement technique of brain functions. More specifically, you will learn basics of neuroimaging techniques, analysis of fMRI data, a combination of fMRI and other techniques (e.g., brain stimulation), and some commonly-held false belief about how the mind and brain function (neuromyths).

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1) explain what functional neuroimaging and brain stimulation methods can be used to investigate the human brain
2) explain how fMRI data can be acquired and analyzed
3) conduct basic fMRI analysis
4) design basic fMRI experiment
5) judge trustworthiness of scientific claims (including neuromyths)

Course Content

The course content includes the lectures on each of the neuroimaging and brain stimulation techniques, visit to neuroimaging facilities, lectures on fMRI analysis, laboratory (hands-on analysis) of fMRI data, and lectures on neuromyths.

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual
1. Online Quiz	1, 2, 4, 5	Creativity, Critical thinking, and Competence	15%	Individual
2. Continuous assessment (Analysis and Neuromyths)	3 and 4	Competence, Critical thinking, Team Work, Oral Communication	35%	Team
3. Project (Oral presentation	1, 2, 4, 5	Creativity, Competence, Critical thinking, Team	50% (30% for Research	Individual

/Research paper)		Work, Oral and Written Communication	Paper and 20% for Oral presentation)	
Total			100%	

Formative feedback

You will have the opportunities to identify your progress in this course via feedback in three different forms: (1) general feedback based on their performance on online quiz and continuous assessment (so you have a chance to evaluate your progress in comparison to the progress of your peers), (2) specific feedback for those who could not perform well on online quiz and continuous assessment and (3) summative feedback of your achievements in relation to the learning outcomes at the end of semester exam.

Learning and Teaching approach

Approach	**How does this approach support you in achieving the learning outcomes?**
Lecture	Through lectures, you could i) understand the basics of neuroimaging techniques, ii) know how these techniques are implemented in actual experiments, iii) analyze fMRI data using a standard software (Statistical Parametric Mapping) in MATLAB platform, and iv) learn how to judge scientific validity of neuroimaging papers. With the help of an online software (e.g., google form) during lectures, you will have a chance to anonymously express your views on frameworks or topics without looking silly in case they fail to get the right answers.
Laboratory	The hands-on exercises on fMRI data analysis to allow you to apply what they have learnt in the lecture.
Interactive classroom activities	Team-based learning to prepare your proposal from what you learned in the lecture and help you critically engage with the material presented in class

Reading and References

Huettel SA, Song AW, McCarthy G (2019). Functional Magnetic Resonance Imaging, 3rd *Ed*. Sinauer.

Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned pre-class readings, attend all lecture classes punctually and take tests on specified dates. You are expected to take responsibility to follow up with course notes and course related announcements for lectures they have missed.

You are expected to read the assigned chapters before coming to class each week.
Lectures are based on 1) the assigned chapters from the textbook and 2) complementary materials that are NOT in the textbook (e.g., manual for the fMRI analysis, films, videos, and class

demonstrations). In the interest of effective learning, instructors may post skeletal class notes online which do not contain all the details of the lectures.

(2) Online quiz
The online quiz will cover the textbook and complementary materials from each lecture (e.g., films). You need to answer the quiz at the end of each lecture except for documented emergency such as medical and family emergencies (i.e. MC submitted to the undergraduate office and notification from them to the course instructor)

(3) Continuous assessment and laboratory
You are required to attend all laboratory sessions. You will analyze fMRI data and submit the description of your analysis and result. When the class size is large, you will form a group with other students in this activity. When you are asked to evaluate fMRI research and neuromyths, you need to write a short report on evaluation of their claims.

(4) Project (Oral presentation/Research paper)
You will present your proposed fMRI study towards the end of the semester and submit the paper at the end of the semester. This paper is a proposal on an fMRI study. Please follow APA format for the write-up.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Course introduction and Neuroimaging techniques	ILO1 explain what neuroimaging techniques are available and general strengths and weakness of each technique	Course documents (slides) and Chapter 1 of the textbook
2	fMRI1 - principles and safety	ILO2 explain why we can measure structures and activity using	Course documents (slides) and Chapter 2, 3, 4, 5

		fMRI and what are necessary to use the MRI safely	
3	fMRI2 - MRI facility visit (Cognitive Neuroimaging Centre) and MATLAB	ILO2 associate your knowledge learned in lecture 2 with a real experimental setting. be ready to analyze fMRI data	Course documents (slides) and Chapter 2, 3, 4, 5, 7
4	fMRI3 – MATLAB and fMRI preprocessing 1	ILO2 and 3 Understanding, explaining, and implementing preprocessing of fMRI data with MATLAB	Course documents (slides) and Chapter 7, 8
5	fMRI4- MATLAB and fMRI preprocessing 2	ILO2 and 3 Understanding, explaining, and implementing preprocessing of fMRI data with MATLAB	Course documents (slides) and Chapter 8
6	fMRI5- fMRI data analysis using MATLAB (1st level)	ILO2 and 3 Understanding, explaining, and implementing fMRI analysis on an individual's brain with MATLAB	Course documents (slides) and Chapter 10
7	fMRI6- fMRI data analysis using MATLAB (2nd level)	ILO2 and 3 Understanding, explaining, and implementing fMRI analysis at group level with MATLAB	Course documents (slides) and Chapter 10
8	fMRI7- fMRI data analysis using MATLAB (advance topic)	ILO2 and 3 Understanding advanced fMRI analysis with MATLAB	Course documents (slides) and Chapter 11
9	Designing your own experiment 1	ILO4 Design your fMRI experiment	Course documents (slides) and Chapter 9
10	Combining fMRI with other techniques	ILO1 Understanding and explaining other techniques that can complement neuroimaging (e.g., brain stimulation)	Course documents (slides) and Chapter 13

11	Evaluating fMRI paper and Neuromyths	ILO2, 5 Apply the knowledge to judge trustworthiness of scientific claims	Course documents (slides)
12	Advanced topics of neuroimaging	ILO1 Inviting experts in other neuroimaging techniques (EEG, MEG or NIRS) and discuss similarity and differences	Course documents (slides)
13	Designing your own experiment 2	ILO4 Design your fMRI experiment	Course documents (slides) and Chapter 9