The Master 2 Neurosciences - Neurophysiology of Perception and Sensorial Evaluation programme offered by the University Lyon 1 has the overall aim of training professionals capable of understanding the cognitive, physiological and emotional aspects of perception in the conception, realisation and interpretation of studies focussing on the end user, whether this be a consumer, user, patient, health care professional ... A typical mission might consist of measuring the impact of a given product on the sensory perceptions (visual, auditory, tactile, olfactory ...) of a person coming into contact with this product.

The course focuses principally on the theoretical and methodological bases of cognitive neurosciences. At the end of the course, students should be able to find solutions to a practical problem posed by an industrialist using their knowledge of general neuroscience and their specific competencies in sensorial analysis. The specificity of its content constitutes the originality and major interest of this course.

The skills acquired by students during their training will hone their ability to « transform » an industrial problem into a neuroscientific question that they are fully equipped to answer through suitable methodical investigation. The various teaching modules included in the course will allow students to acquire the skills necessary to: define and reformulate a demand to fully understanding the needs of the requestor; to construct a project, to master the principal analytical tools (sensorial tests, questionnaires, physiological investigations ...); master the tools for treating collected data (statistical); write a report and propose solutions ....

The areas of application are essentially industrial and are of particular interest to the agro-food, cosmetics, textile, bioengineering, automobile, and environmental industries. Our program prepares students for posts in research and development (e.g. sensorial analysis aiding in product conception), marketing (e.g. analysis of consumer preferences and expectations), and quality control.

The course includes 361 hours of teaching. This does not include the time spent in personal study, either individually or as a group, nor the period spent gaining practical experience in the workplace. All the courses will be in English.

« Skills-based » transversal teaching modules

- **Statistics**(3ECTS credits)
    1. This teaching unit aims at mastering methods used for understanding, selecting and using appropriate and advanced statistics in neurosciences.
    2. To extend student's knowledge of the use of statistics as required for scientific research; the following topics will be covered:
        - Nonparametric statistics
        - ANOVA with two or more variables -   Multiple regression analysis (linear, logistic, mixed)
        - PCA/FCA
        - Discriminant analysis
        - Classification methods
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- **English** (3 ECTS credits)

    Communication skills in written and spoken English with a focus on the scientific domain. English courses specifically designed for scientific communication. This includes writing scientific reports writings, training for oral presentations, and job interviews.

- **Project Management** (3 ECTS credits)

    1. To present the methodological bases of project management, whether this is for the elaboration of the project (identification of needs, formulation of objectives, identification of constraints, definition of solutions in terms of content/scope/quality, delay, budget/resources…), for successful completion of the project (setting up and implementation of each step, pilot committees…), or for its management (setting up of partners and follow-up procedures, empowerment and motivation of teams, fine-tuning, communication and valorization…).
    2. To put into practice, the theoretical, methodological, and technical knowledge acquired in other disciplines within the Master's programm. Students will be required to carry out a 'mission' consisting of responding to a problem put out to tender by an industrial partner. In response to a bid solicitation the students, working in small groups and in competition with each other, must conceive an exploratory project using sensorial analysis to directly respond to the problems they are given. They will be required to design the necessary analyses, and present the materials and methods required to achieve their aims and the financial cost of their project. A written report summarizing the work will be drawn up at the end of the course, distributed to the various partners and defended before a jury composed of university staff and non-academic members drawn from the world of research or industry. At the end of the evaluation of the project, the groups will come together to put the proposed project into operation (see **Applications in the World of Business**)

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Specialized teaching modules

- **Psychophysiology** (6 ECTS credits)
    1. To develop the theoretical bases necessary for each student's professional development i.e. the neurobiological bases for treating sensorial input. Three topics will be addressed:

        - The senses and sensory processing (sensory processing disorders; sight; smell; hearing; touch; taste and flavors; somesthesia and sensorimotor control; sensorial integration and intermodal interactions; conscious and unconscious perception)

        -Memory and perception (role of memory in perception; encoding, recall, and recognition of information)

        -Emotion and perception (neuronal bases of emotion; neuromodulators, social cognition)

    2. To train students in the use of the tools used to measure and quantify that are indispensable when carrying out neurosensory and perception analyses. In conjunction with the theoretical content, practical work will give students grounding in the techniques for controlling and measuring stimuli and in how to record the physiological and behavioural responses to these stimuli.

    3. The S-R paradigm
        Techniques and instrumentation (e.g. luminance, chromatography, physical chemistry, audiograms...)
        Standard parameters (intensity, frequency, variability...)
        Measurement of physiological responses
        Measurements with high temporal resolution: (EEG)
        Measurements with high spatial resolution: (fMRI)
        Measuring the action of the peripheral nervous system (respiration, EDR, ECG, temperature)
        Measuring motor activations: (EMG, kinematic)
        Measuring behavioural responses: chronometry (reaction times), sensory psychophysics (taste, hearing, and smell thresholds)
        Sensory evaluation (discrimination tests, profiles....)
        Methods for analysis of spontaneous behaviour
        Consumer tests (qualitative and quantitative)

- **Sensory Analysis and consumer studies** (6 ECTS credits)

    Market research using consumer testing is a requisite step in all areas reliant on sensorial analysis. This module aims to give students the principal tools they will need in this area. Subjects covered include:

    1. Sensorial analysis

        After a look at all the various discriminative and descriptive techniques in existence, the module will then focus on the ever more widespread technique of sensorial profiling, a technique that must be mastered both in theory and in practice. This will give students the means to constitute and train a panel of experts and then to collect, analyze and interpret the results obtained.

    2. Quantitative consumer studies

        The module will look at the aims and principles of product testing and the various means of carrying out such tests and interpreting their results. Particular attention will be paid to the recruiting of consumers, to the choice of response scales, and statistical treatment of data obtained. Preference mapping will also be studied both in theory and in practice.

3. Qualitative consumer studies

The main qualitative principles will be covered (aims, principles, methods, treatment): focus groups, individual interviews, and observations in situ.

During the practical sessions, students will be required to carry out a consumer study on two types of product, one a food and the other a textile, within the confines of the university premises. Each constituted group must define the sensorial profile of their student population, carry out a consumer survey and qualitative studies and perform preference mapping. Jointly responsible for the statistical analysis of the data obtained they will then be required to present their results to a jury.

➢ **Business Applications**
➢ (3 ECTS credits)
   1. To present the characteristics of the functioning of businesses and the areas of expertise looking for in the areas of neurosensorial analysis and sensory perception. Guest speakers from the world of business will present the finalities, methods, and constraints of their work through the presentation of typical projects and particular missions on which they have worked.
   2. To inform students regarding the law and working practices in this domain (ethics, confidentiality, patents, etc.)
      The module will include the following: *The major functions of a company and the roles of each department; The role of the project engineer; Founding a company; Industry specificities (Cosmetics, Agro-food, Environmental, Transport, Automobile, Textiles, and Clothing industries); Legislation, confidentiality, and patents; Ethics, Health, and Safety, Testing protocols, Legislation for the cosmetics industry; Quality; Product safety, AFNOR & ISO 2000 certification …*

   3. Implementation of the project drawn up as part of the Project Management module. In collaboration with a company and under the tutelage of a member of the teaching staff a pilot study may be begun using the facilities of the sensorial analysis laboratory within the university. The results will be presented to the company.

➢ **Data** (3 ECTS credits)
   This teaching unit provides hands-on training in data analysis, using previously acquired datasets.
➢ **P Internship**: 6 months (for those not following the course under the sponsorship of their employers)

Full-immersion in the world of sensorial analysis in a company for a period of 6 months in France or abroad. Students can also apply for their internship to the work/study training program (alternance, alternating one month at the University and one month at the company during the first semester and entirely at the company during the second semester).

Specificities for employer-sponsored students

The Project Management and Statistics modules are adapted to a project that may be carried out in the company.