

## Studies Plan

### Neuro-X 2024-25

#### Block 2

| Courses       |   |                 | Master 1       | Master 2 | Exam Session | Exam       | Credit                 |   |
|---------------|---|-----------------|----------------|----------|--------------|------------|------------------------|---|
| Language Code | Section                                     | Teacher         | Specialization | en p     | l e p        |            |                        |   |
| E             | <b>Neuro-X project I</b><br>NX-491 NX       | Profs<br>divers |                | 8h       | 8h           | Sum<br>Win | During the<br>semester | 8 |
| E             | <b>Neuro-X project II</b><br>NX-492 NX      | Profs<br>divers |                | 7h       | 7h           | Sum<br>Win | During the<br>semester | 7 |
|               | <b>HSS : Introduction to project</b><br>SHS |                 |                |          |              | Win        |                        | 3 |
|               | <b>HSS : Project</b><br>SHS                 |                 |                |          |              | Sum        |                        | 3 |

#### Group 1

| Courses       |   |  | Master 1       | Master 2 | Exam Session | Exam | Credit                 |   |
|---------------|---|--|----------------|----------|--------------|------|------------------------|---|
| Language Code | Section   | Teacher                                | Specialization | en p     | l e p        |      |                        |   |
| E             | <b>Brain-like computation and intelligence</b><br>NX-414 NX             | Mathis<br>Schrimpf                     |                |          | 2h 2h        | Sum  | Written                | 5 |
| E             | <b>Computational neurosciences: neuronal dynamics</b><br>NX-465 NX      | Gerstner                               |                |          | 2h 2h        | Sum  | Written                | 5 |
| E             | <b>Machine learning</b><br>CS-433 IN                                    | Flammarion<br>Jaggi                    |                | 4h 2h 2h |              | Win  | Written                | 8 |
| E             | <b>Neural interfaces</b><br>NX-422 NX                                   | Lacour<br>Shoaran                      |                | 4h 2h    |              | Win  | During the<br>semester | 6 |
| E             | <b>Neural signals and signal processing</b><br>NX-421 NX                | Micera<br>Van De<br>Ville              |                | 4h 2h    |              | Win  | Written                | 6 |
| E             | <b>Neuroscience: behavior and cognition</b><br>BIO-483 SV               | Blanke<br>Sandi                        |                |          | 3h 2h        | Sum  | Written                | 5 |
| E             | <b>Neuroscience: cellular and circuit mechanisms</b><br>BIO-482 SV      | Crochet<br>Petersen                    |                | 3h 2h    |              | Win  | During the<br>semester | 5 |
| E             | <b>Neuroscience: from molecular mechanisms to disease</b><br>BIO-480 SV | Gräff<br>Mahul<br>Mellier<br>Schneider |                | 3h 2h    |              | Win  | Written                | 5 |
| E             | <b>Translational neuroengineering</b><br>NX-423 NX                      | Blanke<br>Courtine<br>Hummel<br>Micera |                |          | 3h 3h        | Sum  | Written                | 6 |

#### Group 3

| Courses       |  |                 | Master 1       | Master 2 | Exam Session | Exam       | Credit                 |   |
|---------------|--|-----------------|----------------|----------|--------------|------------|------------------------|---|
| Language Code | Section  | Teacher         | Specialization | en p     | l e p        |            |                        |   |
| E             | <b>Industry internship in Neuro-X</b><br>NX-591 NX | Profs<br>divers |                | 320h     | 320h         | Sum<br>Win | During the<br>semester | 8 |

#### Group 4

| Courses | Master 1 | Master 2 | Exam | Exam | Credit |
|---------|----------|----------|------|------|--------|
|---------|----------|----------|------|------|--------|

| Language | Code | Section   | Teacher | Specialization        | p | l  | e  | p  | Session |                       |
|----------|------|---|---------|-----------------------|---|----|----|----|---------|-----------------------|
| E        |      | <b>Advanced computer graphics</b><br>CS-440                         | IN      |                       |   | 2h | 1h | 1h | Sum     | During the 6 semester |
| E        |      | <b>Advanced methods for human neuromodulation</b><br>NX-436         | NX      | Hummel                |   | 2h | 2h |    | Win     | Written 4             |
| E        |      | <b>Analog IC design</b><br>EE-320                                   | EL      | Shoaran               |   | 2h | 1h |    | Win     | Written 3             |
| E        |      | <b>Applied biostatistics</b><br>MATH-493                            | MA      | Goldstein             |   | 2h | 2h |    | Sum     | During the 5 semester |
| E        |      | <b>Applied data analysis</b><br>CS-401                              | SC      | Brbic                 |   | 2h | 2h |    | Win     | Written 8             |
| E        |      | <b>Applied probability &amp; stochastic processes</b><br>MGT-484    | MTE     | Cristi                |   | 2h | 2h |    | Win     | Written 4             |
| E        |      | <b>Basics of robotics for manipulation</b><br>MICRO-450             | MT      | Bouri                 |   | 3h |    |    | Win     | Written 3             |
| E        |      | <b>Bioelectronics and biomedical microelectronics</b><br>EE-519     | EL      | Schmid                |   | 2h | 1h |    | Win     | Written 3             |
| E        |      | <b>Biomedical optics</b><br>BIOENG-445                              | SV      | Wagnières             |   | 2h | 1h |    | Win     | Oral 3                |
| E        |      | <b>Biomicroscopy I</b><br>MICRO-561                                 | SV      | Altug                 |   | 2h | 2h |    | Win     | Written 4             |
| E        |      | <b>Biomicroscopy II</b><br>MICRO-562                                | SV      | Altug<br>Seitz        |   | 1h | 1h | 2h | Sum     | During the 4 semester |
| E        |      | <b>Bio-nano-chip design</b><br>EE-517                               | EL      | Carrara               |   | 2h | 2h |    | Win     | Written 4             |
| E        |      | <b>Causal thinking</b><br>MATH-352                                  | MA      | Stensrud              |   | 2h | 2h |    | Win     | Written 5             |
| E        |      | <b>Computational motor control</b><br>CS-432                        | SV      | Ijspeert              |   | 2h | 2h |    | Sum     | Written 4             |
| E        |      | <b>Computational neurosciences: biophysics</b><br>NX-450            | NX      | Romani                |   | 2h | 2h |    | Win     | During the 5 semester |
| E        |      | <b>Computer vision</b><br>CS-442                                    | IN      | Fua                   |   | 2h | 1h |    | Sum     | Written 6             |
| E        |      | <b>Controlling behavior in animals and robots</b><br>BIOENG-456     | SV      | Ramdya                |   | 2h | 3h |    | Sum     | During the 5 semester |
| E        |      | <b>Deep learning</b><br>EE-559                                      | EL      | Cavallaro             |   | 2h | 2h |    | Sum     | During the 4 semester |
| E        |      | <b>Deep learning in biomedicine</b><br>CS-502                       | IN      |                       |   | 2h | 1h | 2h | Sum     | During the 6 semester |
| E        |      | <b>Deep reinforcement learning</b><br>CS-456                        | IN      | Gulcehre              |   | 2h | 1h | 1h | Sum     | Written 6             |
| E        |      | <b>Design in innovation: creation for adoption</b><br>MGT-406       | MTE     | Henchoz<br>Laperrouza |   | 2h | 2h |    | Sum     | During the 4 semester |
| E        |      | <b>Design technologies for integrated systems</b><br>CS-472         | IN      | De<br>Micheli         |   | 3h | 2h |    | Win     | During the 6 semester |
| E        |      | <b>Dynamical system theory for engineers</b><br>COM-502             | SC      | Thiran                |   | 3h | 1h |    | Sum     | Written 6             |
| E        |      | <b>Ethics and law of AI</b><br>DH-415                               | DH      | Rochel                |   | 2h | 2h |    | Win     | During the 4 semester |
| E        |      | <b>Fundamentals of biomedical imaging</b><br>PHYS-438               | PH      | Gruetter              |   | 2h | 2h |    | Sum     | Written 4             |
| E        |      | <b>Fundamentals of biophotonics</b><br>BIO-443                      | SV      | Radenovic             |   | 2h | 1h |    | Sum     | During the 3 semester |
| E        |      | <b>Fundamentals of biosensors and electronic biochips</b><br>EE-515 | EL      | Guiducci              |   | 2h | 1h |    | Win     | Written 3             |
| E        |      | <b>Haptic human robot interfaces</b><br>MICRO-553                   | MT      | Bouri<br>Shokur       |   | 2h | 2h |    | Sum     | Oral 4                |

|   |   |    |  |    |    |     |            |            |          |          |
|---|---|----|--|----|----|-----|------------|------------|----------|----------|
| E | <b>Image analysis and pattern recognition</b>                 |    |  |    |    |     |            |            |          |          |
|   | EE-451  | EL | Bozorgtabar<br>Thiran                        | 2h | 2h | Sum | During the | 4          | semester |          |
| E | <b>Image processing I</b>                                     |    |  |    |    |     |            |            |          |          |
|   | MICRO-511   | MT | Unser<br>Van De<br>Ville                     | 3h |    | Win | Written    | 3          |          |          |
| E | <b>Image processing II</b>                                    |    |  |    |    |     |            |            |          |          |
|   | MICRO-512   | MT | Liebling<br>Sage<br>Unser<br>Van De<br>Ville | 3h |    | Sum | Written    | 3          |          |          |
| E | <b>Introduction to natural language processing</b>            |    |  |    |    |     |            |            |          |          |
|   | CS-431  | IN | Bosselut<br>Chappelier<br>Rajman             | 2h | 2h | Win | Written    | 6          |          |          |
| E | <b>Learning in neural networks</b>                            |    |  |    |    |     |            |            |          |          |
|   | CS-479  | IN | Gerstner                                     | 2h | 1h | 1h  | Sum        | Oral       | 6        |          |
| E | <b>Machine learning for behavioral data</b>                   |    |  |    |    |     |            |            |          |          |
|   | CS-421  | IN | Käser  | 2h | 2h | Sum | Written    | 6          |          |          |
| E | <b>Machine learning I</b>                                     |    |  |    |    |     |            |            |          |          |
|   | MICRO-455   | MT | Billard                                      | 4h |    | Win | Written    | 4          |          |          |
| E | <b>Mathematics of data: from theory to computation</b>        |    |  |    |    |     |            |            |          |          |
|   | EE-556  | EL | Cevher                                       | 3h | 3h | Win | Written    | 6          |          |          |
| E | <b>MRI Practicals on CIBM preclinical imaging systems</b>     |    |  |    |    |     |            |            |          |          |
|   | PHYS-473  | PH | Cudalbu<br>Lanz                              | 2h | 1h | Win | During the | 3          | semester |          |
| E | <b>Nanotechnology</b>   |    |  |    |    |     |            |            |          |          |
|   | MICRO-530   | MT | Boero<br>Brugger                             | 3h |    | Sum | Oral       | 3          |          |          |
| E | <b>Neural circuits of motivated behaviors</b>                 |    |  |    |    |     |            |            |          |          |
|   | BIO-499   | SV | Kochubey<br>Schneggenburger                  | 2h | 2h | Sum | Written    | 4          |          |          |
| E | <b>Optimization for machine learning</b>                      |    |  |    |    |     |            |            |          |          |
|   | CS-439  | IN | Flammarion                                   | 2h | 2h | 1h  | Sum        | Written    | 8        |          |
| E | <b>Organic and printed electronics</b>                        |    |  |    |    |     |            |            |          |          |
|   | MICRO-505   | MT | Briand<br>Subramanian                        | 2h |    | Sum | Oral       | 2          |          |          |
| E | <b>Regulatory, quality and clinical affairs</b>               |    |  |    |    |     |            |            |          |          |
|   | NX-451  | NX | Rochat                                       | 1h | 1h | Sum | During the | 2          | semester |          |
| E | <b>Scientific literature analysis in neuroscience</b>         |    |  |    |    |     |            |            |          |          |
|   | BIOENG-451  | SV | La<br>Manno                                  | 1h | 3h | Win | During the | 4          | semester |          |
| E | <b>Scientific project design in integrative neurosciences</b> |    |  |    |    |     |            |            |          |          |
|   | BIO-493   | SV |  | 1h | 3h | Win | During the | 4          | semester |          |
| E | <b>Sensors in medical instrumentation</b>                     |    |  |    |    |     |            |            |          |          |
|   | EE-511  | EL | Chételat<br>Ionescu                          | 2h | 1h | Sum | Written    | 3          |          |          |
| E | <b>Sustainability and materials</b>                           |    |  |    |    |     |            |            |          |          |
|   | MSE-341   | MX | Abitbol                                      | 2h | 1h | Sum | During the | 3          | semester |          |
| E | <b>Systems neuroscience</b>                                   |    |  |    |    |     |            |            |          |          |
|   | NX-435  | NX | Mathis                                       | 2h | 2h | Sum | During the | 4          | semester |          |
| E | <b>Understanding statistics and experimental design</b>       |    |  |    |    |     |            |            |          |          |
|   | BIO-449   | SV |  | 2h | 2h | Win | Written    | 4          |          |          |
| E | <b>Virtual reality</b>  |    |  |    |    |     |            |            |          |          |
|   | CS-444  | IN | Boulic                                       | 2h | 1h | Sum | During the | 6          | semester |          |
| E | <b>Visual intelligence : machines and minds</b>               |    |  |    |    |     |            |            |          |          |
|   | CS-503  | IN | Zamir  | 2h | 1h | 1h  | Sum        | During the | 6        | semester |

Master project

| Courses       |  |                       | MP Autumn | MP Spring | Exam Session | Exam | Credit |
|---------------|--|-----------------------|-----------|-----------|--------------|------|--------|
| Language Code | Section                                | TeacherSpecialization | h         | h         |              |      |        |
| E             | Master project in Neuro-X<br>NX-599 NX | Profs<br>divers       | 900h      | 900h      | Sum<br>Win   | Oral | 30     |