



# FACOLTA' DI INGEGNERIA DI PISA

## ATTIVITA' FORMATIVE A.A. 2023-2024

### Laurea Magistrale

### BIONICS ENGINEERING

#### Sezione 1: Manifesto degli studi

| Anno di corso   | [SSD]                   | CFU |   | Per | Note | Lab |
|---|-------------------------|-----|---|-----|------|-----|
| <b>Primo anno</b>                                       |                         |     |   |     |      |     |
| Methods and techniques of measurement and data analysis | ING-INF/06              | 6   |   | 2   |      |     |
| Statistical Signal Processing                           | ING-INF/03              | 6   |   | 1   |      |     |
| Bioinspired Computational Methods                       | ING-INF/05              | 6   | 6 | 1-2 | 1    |     |
| Analysis of bionic and robotic systems                  | [ING-INF/06,ING-IND/34] | 6   | 6 | 1.2 | 2    |     |
| <b>Neural Engineering (12CFU)</b>                       |                         |     |   |     |      |     |
| Applied Brain Science                                   | [INF/01 ING-INF/06]     | 6   | 6 | 1-2 | 3    |     |
| <b>Biorobotics (12 CFU)</b>                             |                         |     |   |     |      |     |
| Bioinspired and soft robotics                           | ING-IND/34              | 6   | 6 | 1-2 | 4    |     |
| A scelta dello studente                                 |                         | 12  |   |     |      |     |
| <b>Secondo anno</b>                                     |                         |     |   |     |      |     |
| Prova finale  |                         | 15  |   |     |      |     |
| Lab training  |                         | 3   |   |     |      |     |
| <b>Neural Engineering (42CFU)</b>                       |                         |     |   |     |      |     |
| Interactive Systems and Affective Computing             | [INF/01, ING-INF/06]    | 6   | 6 | 1-2 | 5    |     |
| Neural Prostheses                                       | ING-INF/06              | 6   | 6 | 1-2 | 6    |     |
| Integrative Cerebral Function and Image Processing      | [MPSI/02,ING-INF/06]    | 6   | 6 | 1-2 | 7    |     |
| Bionic Senses   | ING-INF/06              | 6   |   | 1   |      |     |
| <b>Biorobotics (42 CFU)</b>                             |                         |     |   |     |      |     |
| Design principles for bionic tissue engineering         | ING-INF/06              | 6   |   | 1   |      |     |
| Wearable robotics                                       | ING-IND/34              | 6   | 6 | 1-2 | 8    |     |
| Rehabilitation and assistive technologies               | ING-IND/34              | 6   | 6 | 1-2 | 9    |     |
| Advanced interventional and therapeutic technologies    | ING-IND/34              | 6   | 6 | 1-2 | 10   |     |

| Dettagli insegnamenti integrati (nota INT)               |  |            |     |      |
|--|--|------------|-----|------|
| Insegnamento Integrato o plurisetoriale                  | Modulo (solo se integrato)                           | [SSD]      | CFU | Per. |
| 1) Bioinspired Computational Methods                     | Neural and Fuzzy Computation                         | ING-INF/05 | 6   | 2    |
|  | Biological Data Mining                               | ING-INF/05 | 6   | 1    |
| 2) Analysis of bionic and robotic systems                | Principles of bionics and biorobotics engineering    | ING-IND/34 | 6   | 1    |
|  | Modeling of multi-physics phenomena                  | ING-INF/06 | 6   | 2    |
| 3) Applied Brain Science                                 | Behavioural and Cognitive Neuroscience               | ING-INF/06 | 6   | 1    |
|  | Computational Neuroscience                           | INF/01     | 6   | 2    |
| 4) Bioinspired and soft robotics                         | Mechanics of smart materials and structures          | ING-IND/34 | 6   | 1    |
|  | Soft robotics technologies                           | ING-IND/34 | 6   | 2    |
| 5) Interactive Systems and Affective Computing           | Interactive Systems                                  | INF/01     | 6   | 1    |
|  | Affective Computing                                  | ING-INF/06 | 6   | 2    |
| 6) Neural Prostheses                                     | Neural Tissue Engineering                            | ING-INF/06 | 6   | 1    |
|  | Neural Interfaces and Bioelectronic Medicine         | ING-INF/06 | 6   | 2    |
| 7) Integrative Cerebral Function and Image Processing    | Integrative Cerebral Function                        | MPSI/02    | 6   | 2    |
|  | Advanced Image Processing                            | ING-INF/06 | 6   | 1    |
| 8) Wearable robotics                                     | Prostheses   | ING-IND/34 | 6   | 1    |
|  | Exoskeletons   | ING-IND/34 | 6   | 2    |
| 9) Rehabilitation and assistive technologies             | Biomechanics of human motion                         | ING-IND/34 | 6   | 1    |
|  | Robotic and data-driven rehabilitation               | ING-IND/34 | 6   | 2    |
| 10) Advanced interventional and therapeutic technologies | Robotics for minimally invasive and targeted therapy | ING-IND/34 | 6   | 1    |
|  | Bionic organs and tissues                            | ING-IND/34 | 6   | 2    |



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### Sezione 2: Dettagli attività a scelta

#### Insegnamenti dell'Ateneo consigliati come attività a scelta dello studente

| <i>Insegnamento</i>                                     | <i>[SSD]</i> | <i>CFU</i> | <i>Per.</i> | <i>Note</i> |
|---|--------------|------------|-------------|-------------|
| Robot programming frameworks and IoT platforms          | ING-IND/34   | 6          | 1           |             |
| Electronics for Bionics engineering                     | ING-INF/01   | 6          | 2           |             |
| Advanced materials for bionics                          | ING-IND/34   | 6          | 1           |             |
| Neuromorphic engineering                                | ING-IND/34   | 6          | 2           |             |
| Artificial intelligent systems for human identification | ING-INF/06   | 6          | 2           |             |
| Probability and Biostatics                              | ING-INF/06   | 6          | 1           |             |