**MOOC supplement**
**The supplement contains contextual information about your MOOC.** This general information is intended to facilitate student and institute in their process of recognition of the MOOC within an educational program. See information on levels below, we revised the levels of EdX.

| | GENERAL INFORMATION |
|---|---|
| Course code and title | Neuronal dynamics: **Computational Neuroscience of Single Neurons** |
| Subject area | Life sciences, mathematical modelling of brain processes |
| Institute | EPFL |
| Platform | This MOOC is delivered through EdX |
| Type MOOC Assessment | Written and Project |
| | COURSE LEVEL AND WORK LOAD |
| Level* | Advanced |
| Original University Level | Master |
| Estimated total workload in hours | Nr of hours: 42 (7 weeks 6 hours)     Nr of ECTs (1ECTS= 28 hours): **4** |
| Expected prior knowledge/prerequisites | Lineair algebra, Probability and statistics, Dynamic systems Theory for Engineers or Mathematical Computation Models in Biology |
| | COURSE CONTENT |
| Main topics Topics per week | Week 1: A first simple neuron model |
| | Week 2: Hodgkin-Huxley models and biophysical modeling |
| | Week 3: Adding detail: dendrites and synapses |
| | Week 4: Reducing detail: two-dimensional models |
| | Week 5: Variability of spike trains and the neural code |
| | Week 6: Noise models, noisy neurons and coding |
| | Week 7: Estimating neuron models for coding and decoding |

| | |
|---|---|
| Learning Outcomes<br>After the course you are able to | Students will learn how mathematical tools such as differential equations, phase plane analysis, separation of time scales, and stochastic processes can be used to understand the dynamics of neurons and the neural code.<br><br>By the end of the course, students must be able to:<br>Analyze two dimensional models in the phase plane<br>Solve linear one-dimensional differential equations<br>Develop a simplified model by separation of time scales<br>Analyze connected networks in the mean-field limit<br>Formulate stochastic models of biological phenomena<br>Formulize biological facts into mathematical models<br>Prove stability and convergence<br>Apply model concepts in simulations<br>Predict outcome of dynamics<br>Describe neuronal phenomena. |
| Teaching method | Video lectures, readings, practice quizzes |
| Assessment methods | Online quizzes with multiple choice questions, online exam, and 4 short answer assignments |
| | **PRACTICAL MATTERS** |
| Date MOOC runs, paced or self-paced<br>(How flexible is the start date) | Session _based |
| Frequency of MOOC run<br>Per academic year | For credits just once a year |
| | **ADDITIONAL INFORMATION VIRTUAL EXCHANGE STUDENTS** |
| Type of student this Online course could be interesting for | Life sciences, neuroscience, |
| Type of additional assessment for campus students | CAPSTONE |
| Timing of the additional assessment | ONCE A YEAR |
| Max number of exchange students per run | 10 |
| Different time zones, multiple exams possible? | NO |
| Grading** | Swiss system (see below) |

**\*Levels MOOCs**
To enable evaluation of the level of a MOOC by student and also the university (stakeholders such as programme directors, teachers and board of examiners), we revised the levels

indicated on edX, with a focus on issuing credits for either bachelor or master programs of our universities. The levels described below are an *indication only* for the course level. Combined with clear prerequisites, they provide more insight in the level of the MOOC.

➢ **Introductory** – This is an introductory undergraduate/bachelor course building on knowledge acquired during pre-university education. The latter can be specific knowledge for example in a discipline like having an understanding physics, math etc. on high school level.

➢ **Intermediate** – This is an advanced undergraduate/bachelor course. Some specific knowledge and experience on university level is needed to follow and finish this course.

➢ **Advanced**- These are courses on master level or higher. Specific knowledge and experience at completed bachelor level is needed to follow and finish this course. The learner acquires specialized knowledge.

## ** Grading scales

Grading scales table                Based on the ECTS conversion table (1993)

| | | D | A | B | DK | E | SF | F | UK | GR | IS | I | IRL | NL | P | PR | S | CH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ECTS | Germany | Austria | Belgium | Denmark | Spain | Finland | France | Great Britain | Greece | Iceland | Italy | Ireland | Netherlands | Poland | Portugal | Sweden | Switzerland |
| Excellent | A | 1 | 1 | 20 | 13 | Mhonor | 3 | 18-20 | 1 | 10 | 10 | 30 lode | 1 | 10 | 17 | 20 | VG++ | 6 |
| | | | (>70%) | 19 | 12 | 10 | | (TB) | | | 9 | | | 9 | 16 | 19 | | |
| | | | | | | | | | | | | | | | | 18 | | |
| Very good | B | 1- | | 18 | 11 | Sobresaliente | 2.5 | 16-17 | Upper 2nd | 9 | 8 | 30 | 2nd I | 8.5 | 15 | 17 | VG + | 5.5 |
| | | | | 17 | 10 | 9-10 | | (B) | | 8 | | | | | | 16 | | |
| Good | C | 2+ | 2 | 16 | 9 | Notable | 2 | 14-15 | Upper 2nd | 7 | 7 | 29 | 2nd II | 8 | 14 | 15 | VG | 5 |
| | | 2 | | 15 | 8 | 7-8 | | (B) | | | | 28 | | 7.5 | | 14 | | |
| | | 2- | | 14 | | | | | | | | 27 | | | | | | |
| Satisfactory | D | 3+ | 3 | 13 | 7 | Approbado | 1.5 | 12-13 | Lower 2nd | 6 | 6 | 26 | 3rd | 7 | 12 | 13 | G+ | 4.5 |
| | | 3 | | 12 | | 6 | | (AB) | | | | 25 | | 6.5 | 13 | 12 | | |
| | | 3- | | 11 | | | | | | | | | | | | | | |
| Pass | E | 4+ | 4 | 10 | 6 | Approbado | 1 | 10-11 | 3rd pass | 5 | 5 | 24/ | Pass | 6 | 10 | 11 | G | 4 |
| | | 4 | | | | 5 | | (P) | | | | 18 | | | 11 | 10 | | |
| | | 4- | | | | | | | | | | | | | | | | |
| Fail | F | 5 | 5 | 9< | 5< | Suspenso | | 9< | Fail | 4< | Fail | 17< | Fail | 5< | 9 | 9< | U | 4< |
| | | 6 | | | | 4< | | | | | | | | | | | | |

Sweden    U= Underkant (Fail)   G=Godkang (Pass)   VG=V. II Godkind (Pass with distinction)

| EPFL Scale | 6 | 5.5 | 5 | 4.5 | 4 | 3.5 | 3 | 2.5 | 2 | 1.5 | 1 | N A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern America Scale | A | A- | B | B- | C | C- | D | F | F | F | F | Absent |
| ECTS Scale | A | | BC | | ŒE | F | F | | F F | F | F | Absent |