1. **COURSE TITLE:** Developmental Neurobiology

(Compulsory Course of the Master's Program in Neuroscience of the Universidad Autónoma de Madrid (UAM) http://www.ahnfmed.uam.es/studies/master-degree-neuroscience

1.1. **Course type:** Module I (Fundamental Course)

1.2. **Course level :** Postgrade. Master

1.3. **Year of course:** First course of the Master. 2nd Semester

1.4. **Imparting language:** English

1.5. **Prerequisites:** Good level of listening and spoken English.

1.6. **Minimum attendance requirement:** Obligatory assistance of at least 80% of course activities.

1.7. **Number of students enrolled:** from 28 to 35 aprox

1.8. **Faculty data**

Institution: Department of Developmental Neurobiology, Instituto Cajal – CSIC, Madrid (Spain).

Coordinators:
Jose Mª Frade (frade@cajal.csic.es),
Aixa V. Morales (aixamorales@cajal.csic.es)
Sergio Casas Tintó (scasas@cajal.csic.es).

Department Teachers:

Juan de Carlos, Sergio Casas, Fernando de Castro, José Mª Frade, Juan José Garrido, Laura López-Mascaraque, Aixa V. Morales, José Luis Trejo and Carlos Vicario.

Other Teachers:

Paola Bovolenta (CBM, CSIC), Francisco Clascá (UAM), José Miguel Cosgaya (IIB, CSIC), Ruth Diez del Corral (F. Champalimaud, Lisbon), Pilar Esteve (CBM, CSIC), Fernando Giráldez (UPF, Barcelona), Alicia Mansilla (Hospital 12 de Octubre, Madrid) and Marta Nieto (CNB, CSIC).

Administrative information:
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Office hours: depending on teacher's availability.

1.9. Course objectives and organization

The theoretical-practical course will focus in understanding the molecular and cellular processes that govern the development of the nervous system. The course will cover from early stages of neural plate induction, the regionalization and patterning of the neural tube, the generation of the peripheral nervous system, neurogenesis and gliogenesis, neural cell migration, axonal growth, the establishment and organization of neural networks and finally the organization of the cortex brain and sensory organs. For that purpose, the course will discuss the use of different model systems common in Developmental Biology: *Drosophila*, chicken, *Xenopus,* zebrafish and mouse embryos, and also human cells and organoids. The course will also present discussions about human conditions associated to developmental disorders. The course will consist on the following parts:

1. Theoretical classes that will be distributed along the afternoon of 7 days (3 to 4 hours per day from 15:00 to 19:00), according to the Course content table in the next page.
2. Practical sessions (two sessions, 4 hours each) during two days.

The first practical session will consist in obtaining chicken embryos from fertilized eggs at different developmental stages to identify the main neural structures. On the second session, students will analyse and identify different *Drosophila* mutants relevant to understand the general body plan and nervous system development.

3. Seminars from external invited speakers to discuss about their recent findings in Developmental Biology (2 hours each on two different afternoons).
4. During the morning of the two weeks of the course, students will stay in research laboratories at the Cajal Institute to learn about ongoing Neurobiology projects. They will be able to choose a maximum of two laboratories from Cajal Institute, listed in the web page: http://www.cajal.csic.es/ingles/neurobiologia-molecular.html

Throughout the course, students will acquire a good level of analysis, criticism and discussion skills on developmental neurobiology issues. To reach these objectives we propose:

- Critical reading of research articles that will be presented by students to be discussed with other students and teachers.
- Promote discussions during the theoretical and practical courses.
- Promote their communication skills to present scientific projects and results.

2. Course calendar and content

The calendar and the course content will be published in the Master of Neurosciences web page: http://www.ahnfmed.uam.es/estudios/master-neurociencia

2.1. Course content

T1. Temporal course and comparative aspects of nervous system organogenesis. **Francisco Clascá**
T2-3. Global aspects of celular differentitation and histogenesis mechanisms of the nervous system (I and II). **Francisco Clascá**
T4. Induction of the neural plate, regionalization and morphogenesis. **Ruth Diez del Corral**
T5. Regionalization of the spinal cord and rhombencephalon. **Ruth Diez del Corral**
T6. Regionalization of the brain. **Pilar Esteve**
T7. Neural crest as origin of the peripheral nervous system: induction and generation. **Aixa Morales**
T8. Neural crest as origin of the peripheral nervous system: induction and generation. **Aixa Morales**
T9. Neural precursors proliferation control and neurogenesis. **José María Frade**
T10. Cell death during nervous system development. **Jose M Frade**
T11. Neuronal migration. **Juan de Carlos**
T12. Cerebral cortex development. **Juan de Carlos**
T13. Mechanisms of acquisition of morphological and functional polarity of neurons. **Juan José Garrido**
T14. The initial segment of the axon: Mechanisms of formation and modulation of neuronal excitability. **Juan José Garrido**
T15-16. Growth and axonal guide: basic concepts. **Paola Bovolenta**
T17. Development of networks in the cerebral cortex: dendrites, spines and axon. **Marta Nieto**
T18. Drosophila nervous system development. **Sergio Casas**
T19. Differentiation and neural specification in the olfactory bulb I and II. **María Figueres-Oñate**
T20. Sensory systems: Eye development. **Alicia Mansilla**
T21. Sensory systems: Ear development. **Fernando Giráldez**
T22. Differentiation of oligodendrocytes. Myelination. **Fernando de Castro**
T23. Myelination of the peripheral nervous system. **Jose Miguel Cosgaya**
T24. Neurogenesis in the adult nervous system: role of neural stem cells. **Carlos Vicario**
T25. Contribution of Adult Neurogenesis to Animal Behavior. **Jose Luis Trejo**

PRACTICAL CLASSES
Use of the chicken embryo as a model system in Developmental Neurobiology. Analysis of developmental mutants in *Drosophila* nervous system.

SEMINARS
S1. Presentations and discussion of a significant advance of knowledge in Developmental Neurobiology (by pairs of students).
S2. Seminar cycle of the Department of Neurobiology of Development- Cajal Institute.

- Theoretical classes: 26 h.- Practical classes: 8 h. - Developmental Neurobiology Seminars (external speakers): 4 h - Seminars taught by students: 8 h.