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 number: 32041

1.2. Course type: Module I (Fundamental Course)

1.3. Course level : Postgrade. Master

1.4. Year of course: First course of the Master. 2nd Semester

1.5. Imparting language: English

1.6. Prerequisites: Good level of listening and spoken English.

1.7. Minimum attendance requirement

Obligatory assistance of at least 80% of course activities.

1.8. Number of students enrolled: from 28 to 30

1.9. Faculty data

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

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

Department Teachers:

Sergio Casas, Fernando de Castro, José Mª Frade, Juan José Garrido, Sergio Gascón, María Figueres, Aixa V. Morales and Carlos Vicario.

Other Teachers:

Juan Antonio Moreno (INA, 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), Marta Nieto (CNB, CSIC), Juan José Sanz-Ezquerro (CNB, CSIC), Esther Serrano (CBM, CSIC).

Administrative information:

* Department of Anatomy, Histology and Neuroscience
Faculty: Medicine School, Universidad Autónoma de Madrid
Office – Module: Module A of Medicine School.
Phone: +34 91 497 7573//+34 91 497 53 22 Email: master.neurociencia@uam.es
Website: http://www.ahnfmed.uam.es/studies/master-degree-neuroscience
Office hours: depending on teacher's availability.

1.10. 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 this 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 finding in Developmental Biology (2 hours each on two different afternoons).

4. During the morning of the two weeks that last 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 the Cajal Institute listed in the web page: http://www.cajal.csic.es/ingles/)

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. Animal models and signaling pathways in Neurodevelopmental Biology. **Juan J. Sanz-Ezquerro.**
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 M Frade**
T10. Cell death during nervous system development. **José M Frade**
T11. Mechanisms of acquisition of morphological and functional polarity of neurons. **Juan José Garrido**
T12. Cerebral cortex development. **Marta Nieto**
T13. Development of networks in the cerebral cortex: dendrites, spines and axon. **Marta Nieto**
T14. Sexual differentiation of the nervous system. **Esther Serrano**
T15-16. Growth and axonal guide: basic concepts. **Juan Antonio Moreno**
T17 Sensory systems: Ear development. **Fernando Giráldez**
T18. Sensory systems: Eye development. **Alicia Mansilla**
T19. Differentiation and neural specification in the olfactory bulb. **María Figueres**
T20 and 21. Drosophila nervous system development. **Sergio Casas**
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. Use of stem cells in cell reprogramming and cell replacement. **Sergio Gascón**

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.