DEVELOPMENTAL NEUROSCIENCE, FALL 2016
NEUR 601 / BIOL 691 / PSYC 592

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Introduction. The genome encodes the structure and function of the nervous system. Building a nervous system from genetic instructions requires embryological signaling and gene regulation, but it also requires directed cellular migration, axonal pathfinding, and formation and remodeling of specific synaptic connections. Finally, patterns of neuronal activity and behavioral experience are used to refine the numbers and types of neurons and their synaptic connections. This course will include an overview of all of these topics, in both vertebrate and invertebrate model systems, together with modern molecular methods for exploring neural development.

Prerequisites. The prerequisites for this class are PSYC 372 (Physiological Psychology), or BIOL 213 (Cell Structure and Function) and BIOL 303 (Animal Biology), or equivalent. This course serves as part of the required core sequence for the Neuroscience Ph.D. program, which means that many students will have taken 1-2 basic (undergraduate-level) courses in neurobiology, and in cell and molecular biology, and in chemistry (and possibly some biochemistry). Therefore we do not include remedial background material in the syllabus.

Contact Information
This course meets Thursdays, 4:30 - 7:10 pm in the Krasnow Institute, room 229.
Fairfax campus office hours: Wednesdays, 10 am – 12 noon in the Krasnow Institute, room 115.
Science & Tech campus office hours: by appointment, Discovery Hall room 305 (ph. 703-993-1069).
E-mail: kfryxell@gmu.edu (I am more likely to respond if you use the subject line "NEUR 601").
Course web site: lecture notes, study problems, etc. will be posted on Blackboard.
Faculty web site: http://mason.gmu.edu/~kfryxell.

Readings. There is one required text for this course, "Development of the Nervous System" by Sanes, Reh & Harris (3rd edition, 2012). Copies of this book are available in the GMU Fairfax bookstore. The books are shelved under all three course numbers listed at the top of this page, so if you don't find it under your course, try looking under another cross-listed course number. The reading list also contains an article in the *Annual Review of Neuroscience* (see below). A free PDF copy of this article is available through the GMU library E-journals web site.

Dates, Times, Building and Parking Information. This course meets Thursdays at 4:30 - 7:10 pm, in the Krasnow Institute, room 229. Note that the main entrance to this building locks automatically at 6:00 pm (so don't be late ☺). Also, the Krasnow Institute parking lot (Lot D) is reserved for Faculty & Staff permits only, and GMU parking regulations are now enforced 24/7. The closest available student parking is in Lot A, Lot C, the Rappahannock River Parking Deck, or the Shenandoah Parking Deck.

Grading summary: 45% midterm exam, 45% final exam, 10% participation. The participation grade is based on both attendance and participation during class (relevant questions and comments).
Exams: Midterm and final examinations will be closed book; a combination of short answer and short essay questions that cover the assigned reading and lecture notes. Each exam will cover one half of the course, and will emphasize the study questions posted each week on Blackboard.
Exam rules: Cell phone use of any kind (including texting) is not allowed during examinations. These and other Honor Code violations will result in a grade of zero for the exam. Excused absences from exams require permission from (two-way conversation with) the instructor prior to the exam. Makeup examinations are not given in this course.

Class Schedule & Reading List

Thursday, Sept 1 – Introduction, and neural induction (lecture 1)
Text, chapter 1.

Thursday, Sept 8 – Polarity and segmentation (lecture 2)
Text, chapter 2.

Thursday, Sept 15 – Genesis and migration (lecture 3)
Text, chapter 3.

Thursday, Sept 22 – Determination and differentiation (lecture 4)
Text, chapter 4.

Thursday, Sept 29 – Axon growth and guidance (lecture 5)
Text, chapter 5.

Thursday, Oct 6 – Synaptic target selection (lecture 6)
Text, chapter 6.

Thursday, Oct 13 – Midterm Exam (covers lectures 1-6)

Thursday, Oct 20 – Naturally-occurring neuron death (lecture 7)
Text, chapter 7

Thursday, Oct 27 – Synapse formation and synapse maturation (lecture 8)
Text, pp. 209-239

Thursday, Nov 3 – Synaptic plasticity and synapse elimination (lecture 9)
Text, pp. 239-261

Thursday, Nov 10 – class does not meet (Society for Neuroscience meeting in San Diego)

Thursday, Nov 17 – Synapse refinement and developmental critical periods (lecture 10)
Text, pp. 261-281

Thursday, Nov 24 (Thanksgiving holiday)

Thursday, Dec 1 – Behavioral development in infants and children (lecture 11)
Text, chapter 10

Thursday, Dec 8 – Behavioral development in adolescents (lecture 12)
Luna, B., S. Marek, B. Larsen, B. Tervo-Clemmens and R. Chahal (2015) An integrative model of the maturation of cognitive control. *Annu. Rev. Neurosci.* 38, 151-170.

Thursday, Dec 15 – Final Exam (covers lectures 7-12)
Final exam will be held in Krasnow Institute room 229, 4:30 pm to 7:15 pm.