BIOL 211 Vertebrate Embryology and BIOL 211L Vertebrate Embryology Laboratory

Embryology Course Information

Lecture: 3 credits. 150 min. per week
Lab: 1 credit. Two lab sessions per week (1 hour 25 min. each session, 2 hr. 50 min. per week)
Lecture and Lab are co-requisites and must be taken concurrently.

- Embryology is a **Group I** Biology Elective.

Catalog Description:

BIOL 211. VERTEBRATE EMBRYOLOGY
A study of human embryology with emphasis on the fundamental development processes common to vertebrate embryos. Topics include gametogenesis, fertilization, and development of the embryo from zygote through the differentiation of the neural tube. The second half of the course is devoted to the development of selected human organ systems including the nervous system, sense organs, and the cardiovascular, digestive, respiratory, and urogenital systems. Prerequisite: BIOL 111 and 112 and CHEM 113 or higher. Corequisite: BIOL 211L. Offered in the Fall semester. *One semester; three credits.*
BIOL 211L. VERTEBRATE EMBRYOLOGY LABORATORY
Laboratory experience to illustrate and explain the principles covered in BIOL 211. Histological, preserved, and selected living materials are studied to illustrate gametogenesis, fertilization, and development of the vertebrate embryo from zygote through the differentiation of organ systems in amphibian, avian, and mammalian embryos. Prerequisite or corequisite: BIOL 211. Offered in the Fall semester. *One semester; one credit*

Objectives:

The lecture course is a study of human embryology with emphasis on the fundamental developmental processes shared by vertebrate embryos. Topics include gametogenesis, fertilization, and development of the embryo from zygote through the differentiation of the neural tube. The second half of the course is devoted to the development of selected human organ systems including the nervous system, sense organs, and the cardiovascular, digestive, respiratory, and urogenital systems. The required laboratory complements the lecture material with a comparison of frog, chick, and pig embryos. Histological, preserved, and selected living materials are studied to illustrate gametogenesis, fertilization, and development of the vertebrate embryo from zygote through the differentiation of organ systems in amphibian, avian and mammalian embryos.

- BIOL 211 is required for Biomedical Science majors. The course is recommended for Biology majors and other students interested in human anatomy. BIOL 211 is especially recommended for students planning post-graduate work in the health professions (e.g., pre-medical students) as well as for students interested in zoology and veterinary medicine. Embryology is designed to be taken first semester of the sophomore year.

Prerequisites: BIOL 111 and 112 (Principles of Biology I and II and labs) and CHEM 113.

Prerequisites by Topic:

The prerequisite year of college biology with laboratory should include an introduction to the evolution, cell biology, anatomy, physiology, genetics, and development of vertebrates. The prerequisite courses should also include the use of compound and dissecting microscopes, identification of animal tissues and organs from microscope slides and photo-micrographs, interpreting detailed diagrams of vertebrate anatomy, and dissection of a representative vertebrate.

Text: Moore, K. L. and T. V. Persaud. 2008. *The Developing Human. Clinically Oriented Embryology*. 8th ed. Saunders. ISBN 978141-6037064 ***or*** (2003) 7th ed. ISBN 9780721694122

Laboratory Manual: Schoenwolf, G. C. 2009. *Laboratory Studies of Vertebrate and Invertebrate Embryos*. 9th ed. Prentice Hall. ISBN 9780321-556943 ***or*** (2001) 8th ed. ISBN 9780138574345

Supplement (or handouts): Lab exercises on gametogenesis, etc.

Medical Dictionary: For example: *Stedman's Medical Dictionary*. 28th ed. 2005. Williams and Wilkins. ISBN 9780781733908

Disposable gloves (latex or nitrile examination gloves) will be needed for a few of the lab sessions.

Lecture Topic	***Moore and Persaud Chapter*** *(8th ed.)*
Lecture Unit 1:	
Embryology: Terms, History & Concepts	1
Spermatogenesis	2
Oogenesis	2
Meiosis (plus Ch. 20: nondisjunction)	2, 20
Reproductive Cycles	2
Lecture Unit 2:	
Fertilization & Cleavage	2
Blastulation & Gastrulation	3
Gastrulation & Germ Layers	3-4
Germ Layer Formation	3-5
Implantation	3-7
Fetal Membranes, Placenta	7
Review of Chs. 3, 4, 5, and 7	
Lecture Unit 3:	
Nervous System (2.5 weeks)	17
Lecture Unit 4:	
Sense Organs: Eye	18
Sense Organs: Ear	18
Integumentary System	19
Cardiovascular System (1.5 weeks)	13
Lecture Unit 5:	
Digestive System	11
Respiratory System	10
Coelom and Mesenteries	8
Pharyngeal Apparatus	9
Urogenital System	12
Comprehensive Final Exam	

Laboratory Topics:

Lab Unit 1:
[1] Microscope use; Begin *Suppl. Ex. 1;* Reprod. Anat.; *Digital images* Meiosis
[2] *Suppl. Ex. 1 Grasshopper testis* Reprod. Anat.; *Digital images* Meiosis
[3] Spermatogenesis: *Suppl. Ex. 1 Grasshopper testis Digital images* Meiosis
[4] Spermatogenesis: *Suppl. Ex. 2 Frog, Rat, Human Digital images* (Repr/Dev Worksheet)
[5] Oogenesis: *Suppl. Ex. 3 Cat ovary* (Anat Worksheet) *Digital images*
[6] Meiosis and Fertilization: *Suppl. Ex. 4 Ascaris Digital images*
[7] Cleavage: *Suppl. Ex. 5 Starfish*; *Schoenwolf manual Ch. 1 Urchin*
[8] Frog: Early embryo. *Schoenwolf Ch. 3, A-G, I-K .* [Live & preserved embryos]
[9] Frog: Early embryo *Schoenwolf Ch. 3, A-G, I-K.*

Lab Unit 2:
[11] Frog: 4 mm., serial c.s., rep. sag. sec. *Schoenwolf Ch. 3, H-K.*
[12]-[13] Frog: 4 mm., serial c.s. [Continue live frog embryos]

Lab Unit 3:
[15] Chick: 33-hr. w.m. *Schoenwolf Ch. 4 A-D, H-P.*
[16] Chick: 33-hr. c.s., 18 & 24-hr. w.m. *Schoenwolf Ch. 4 A-P.*
[17] Chick: 24-hr. w.m., 24-hr. c.s. *Schoenwolf Lab manual Ch. 4 A-P.*

Lab Unit 4:
[19] 48-hr Chick. Live embryos *Schoenwolf Ch. 7 Ex4.2, 4.3, and 4.8.*
[20]-[22] 48-hr. Chick *Schoenwolf Ch. 4 Q-R.*

Lab Unit 5:
[24] Pig, 10 mm., dissection, w.m., sag. sec.; *Schoenwolf Ch. 6 A-E*
[25]-[29] Pig, 10 mm. *Schoenwolf Ch. 6*