Syllabus for Second Half of Biology 133 (Developmental Biology)
First Semester 2021-2022

Objective of the second half: Discuss the key concepts and basic principles in the early development of vertebrates.

Period Covered	Topics	Objectives	Activities
Oct. 27, 29	Key concepts in ontogenetic development	At the end of this lesson, the student should be able to: 1. Define terms commonly used in animal development. 2. Analyze embryonic events based on the defined terms.	Synchronous session - Orientation and class discussion of requirements of the second half <u>Requirements:</u> Two lecture exams Group journal report Asynchronous session - Read and understand Module 1: Key Terms and Concepts. Answer the questions in the discussion links.
November 2-9	Transport of Gametes and Fertilization	At the end of this lesson, the student should be able to: 1. Describe the events in the transport of animal gametes from the male to the female parent. 2. Discuss the events that happen during the	Synchronous session – for one hour to stress important points in the lecture materials and to answer questions.

		fertilization of the egg cells, including the acrosomal reaction. 3. Explain the role of calcium ions during the cortical reaction and how the egg cell is activated to develop.	Asynchronous session - Read and understand the following modules: Module 2: Reproductive Organs and Sexual Cycle Module 3: Gametogenesis Module 4: Fertilization And the following powerpoint presentations: Gametogenesis Spermatogenesis Oogenesis
Nov. 10-16	Cleavage, Blastula and Gastrula ● Formation of the germ layers and early derivatives ● Establishment of the basic embryonic body plan	At the end of this lesson, the student should be able to: 1. Describe the process of making a fertilized egg become a multicellular embryo. 2. Differentiate the different patterns of cleavage seen in different animals 3. Explain how the process of cleavage is regulated in a fertilized zygote. 4. Discuss the formation of a blastula and gastrula in	Synchronous session – for one hour to stress important points in the lecture materials and to answer questions. Asynchronous session - Read and understand the following modules: Module 5: Cleavage and Blastula Module 6: Gastrulation and the Three Germ Layers

		the early stages of development. 5. Discuss how the process of gastrulation transforms the blastula into an embryo with three germ layers. 6. Identify what organs are derived from the three germ layers and other mesenchymal cells.	And the Following powerpoint presentations: Blastula Gastrula
Nov. 17- 23	Development of the body systems: Integument, Skeleton and Muscular systems	At the end of this lesson, the student should be able to: 1. Discuss how the ectoderm and mesoderm layer differentiates into the skin, skeletons and muscles of animals, particularly the vertebrates. 2. Explain how certain abnormalities or anomalies in these organ systems are formed during embryonic development.	Synchronous session – for one hour to stress important points in the lecture materials and to answer questions. Asynchronous session - Read and understand the following module: Module 7: Organogenesis Refer to the links in the module.
Nov 24-30	Nervous system Neural crest Sense organs	At the end of this lesson, the student should be able to: 1. Discuss how the ectoderm differentiates and develops into the nervous	Synchronous session – for one hour to stress important points in the lecture materials and to answer questions.

		system, including the sense organs of vertebrates. 2. Explain how the neural crest is formed during the differentiation of the ectoderm and enumerate derivatives from it. 3. Explain how certain abnormalities or anomalies of the brain, spinal cord and sense organs of vertebrates are formed during embryonic development.	Asynchronous session - Read and understand the following module: Module 7: Organogenesis Refer to the links in the module.
Dec. 1-Dec. 7	Body cavities Digestive system Respiratory system Urogenital system	At the end of this lesson, the student should be able to: 1. Discuss how the embryo forms its body cavities during gastrulation. 2. Discuss how the internal organs of breathing, digestion, excretion and reproduction are formed from either the endoderm or mesoderm or from both during the embryonic development. 3. Explain how certain abnormalities or anomalies of the	Synchronous session – for one hour to stress important points in the lecture materials and to answer questions. Asynchronous session - Read and understand the following module: Module 7: Organogenesis Refer to the links in the module.

		respiratory, digestive and urogenital systems of vertebrates are formed during embryonic development.	
Dec. 8-Dec 15	Cardiovascular system	At the end of this lesson, the student should be able to: 1. Discuss how the mesoderm differentiates and develops into the cardiovascular system of vertebrates. 2. Explain how the heart, blood vessels, blood cells and blood are formed during the differentiation of the mesoderm. 3. Discuss the pattern of establishing connections between the organs and the vascular system. 4. Explain how certain abnormalities or anomalies of the brain, spinal cord and sense organs of vertebrates are formed during the embryonic development.	Synchronous session – for one hour to stress important points in the lecture materials and to answer questions. Asynchronous session - Read and understand the following module: Module 7: Organogenesis Refer to the links in the module.