# Seminar in Developmental Biology



## **Course Description:**

This is a one-semester integrated course that is designed to give students in their senior year a unique experience in exploring the field of developmental biology. Topics covered may include, fertilization, early embryogenesis with a focus on neurogenesis. Students will also have the opportunity to research current topics in developmental biology that are influencing human health. These may include embryo gene editing, stem cell therapies, and current environmental factors that alter human development, such as viral infections, lead and other environmental contaminants. The seminar course will be largely based on student-led presentations and discussions on original and current research, and requires students to review scientific papers and critique them.

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Reading materials: Students will use recently published research papers in developmental biology which will be selected with the help of the instructor from peer-reviewed science journals, science magazines, or scholarly sources on the internet.

Student Learning Objectives (SSLs and Outcomes): IA= Informally Assessed; FA=Formally Assessed

- To enhance student learning and understanding in the following areas: data acquisition and analysis, experimental design, written and oral communication, using inquiry to analyze and understand structure-function relationships, and relating concepts studied in the classroom to real life situations.
- To develop students' skills and levels of understanding and proficiency in the following Standards of Significant Learning (SSLs):
  - IB (construct meaningful questions that advance learning)
    This is done by analyzing data to draw conclusions and relate it to the concepts.
    FA
  - IC (observe precisely and record accurately)
    This is done through laboratory observations, data collection and analysis. FA
  - ID (critically evaluate information and reasoning)
    This is done by drawing conclusions from laboratory data. FA
  - IIIA (use appropriate technologies as extensions of the mind) This is done by the use of computers and calculators. **IA**
  - IIIB (find and explain connections among things and ideas)
    This is done by making historical connections to the scientists as well as relationships to everyday phenomena. FA
  - IVA (construct and support judgments based on evidence)
    This is done by laboratory exploration, constructing laboratory reports as well as identifying unknown compounds based on previous learnings. FA
  - IVB (write and speak with power, economy and elegance)
    This is done through lab reports, demonstrating understanding through discussions and oral presentations. FA
  - IVC (recognize the parts that make up complex wholes) This is done by applying basic naming and reaction properties to more complex molecules. FA
  - V (make reasoned decisions which reflect ethical standards, and act in accordance with those decisions.
    This is done by not manipulating data to fit conclusions and preventing plagiarism in lab reports. FA

## Specific Assessments and Their Respective Point Values

Students will work in groups for maximum efficiency. Each group of students will be responsible for two presentations on different aspects of developmental biology this

semester. We will discuss what focus the presentations will have as a class. The plan for a week of student presentation will be as follows:

The first day of the week will be spent in setting the stage. The students will be placed in groups and asked to research a model organism used in developmental biology. On the second day of class each group will share what they learned about the biological model.

For the first few weeks of the semester will be an introduction to development biology. Each week there will be assigned readings. Students will work together in groups to lead a class discussion on part of the paper during the next class.

There will be two quizzes over the introductory part of the course one on fertilization/early embryo genesis and the second on neurogenesis.

In the second part of the course students will be presenting two primary literature articles.

The audience always has to complete the following for each presentation:

- 3 questions for discussion
- 2 examples of the topic (case studies)
- 1 summary or quiz

Graded course work will include

- · 2 quizzes background developmental biology
- · Summary or quiz
- Presentations (2 background and 2 research articles)
- Class participation = 4 points/week [Note: For class participation, 4 = exceeds expectations, 3.5 = meets expectations, 3 = some effort but below expectations, and < 3 = poor participation]</li>
- Written questions and case studies submitted for each paper and other assessments.

#### **Student Expectations**

Each student enrolled in the seminar course on developmental biology will:

- 1) bring a laptop computer to class every day,
- 2) complete all reading assignments on time,
- 3) complete weekly writing assignments on time and bring to class
- 4) give two presentations
- 5) lead the class discussion after giving their presentation,
- 6) actively participate in all class discussion sessions by asking or answering questions or sharing relevant comments and information,
- 7) complete all assignments and homework by the specified

## deadlines

- 8) arrive to class on time and prepared for each day's activities.
- \*LATE WORK: A 10% penalty will be deducted from the total points earned for each day late for up to three calendar days from original due date.
- [Note: Please review the Academy's attendance and tardiness procedures described in the Student Handbook. These procedures will be strictly enforced.]

<u>Important</u>: Students should also regularly check their email and Moodle for courserelated information and materials. This might include schedule updates, reading assignments, class handouts, supplements to class discussions, information about upcoming assessments, work for students to complete in the event of a teacher absence, etc.

## Grading

Letter grades at the end of the semester will be assigned as follows:

Letter Grade <u>Average</u>\*

- $\begin{array}{rcl} A & = & 90\text{-}100\% \\ B & = & 80\text{-}89.99\% \\ C & = & 70\text{-}79.99\% \\ \end{array}$
- D = below 70%

Note: The content and sequence of this syllabus is subject to change at the instructor's discretion at any time as necessary

# LIST OF POSSIBLE TOPICS:

CRISPR gene editing to eliminate congenital diseases

Artificial embryos or wombs

Limb regeneration

Stem cell therapies- neurology

Tissue engineering

Effects of plastics on development

Environmental hazards and development

Infections and development

Advances in basic developmental biology

Dates	AC	BD	Class Activity
August	22,24	23,25	Intro to class and Syllabus: model
			organism intro- assignments made
August	28,31	29, Sept 1	Groups present Reproduction
			background-
			oogenesis/spermatogenesis
September	5,7	6,8	Reproduction 2
			Recognition of egg and
			sperm/chromosomal sex
			determination in mammals
September	11,14	12,15	Model organism/ Reproduction
			Quiz/ Neurogenesis 1
September	18,21	19,22	Neurogenesis 2/3
September	25, 28	26,29	Neurogenesis 4/Quiz
October	2,5	3,-	Human Health presentation 1
October	12	10,13	Human Health presentation 1
October	16,19	17,20	Human Health presentation 2
October	23,26	24,27	Human Health presentation 3
October	30, Nov 2	Oct 31, Nov 3	Human Health presentation 4
November	6,9	7,10	Human Health presentation 5
November	13, 16	14, 17	Human Health presentation 6
November	20	21	Environment 1
November	27,30	28, Dec 1	Environment 2, 3
December	4/7	5,8	Environment 4,5
December	11,14	12, 15	Environment 6, TBA
December	18	19	ТВА