Syllabus*: Applied Developmental Biology (1801042366)

COURSE INFORMATION	
Course Name: Applied Developmental Biology **Semester:** **Department:** Department of Biology and Biotechnology **Faculty:** Science	**Course Code:** 1801042366 **Section:** 1 **Core Curriculum**: Biotechnology
Day(s) and Time(s): **Classroom:**	**Credit Hours:** 3 **Prerequisites**: gene expression (1801042326)

COURSE DESCRIPTION

This introductory course in developmental biology is designed to introduce the student with the fundamental processes operating during embryonic development and cellular differentiation of animals. Development will be considered at the organismal, cellular, and molecular levels to provide a total appreciation of developmental phenomena. Topics that will be covered in this course include animal reproduction and fertilization, early development in invertebrates, amphibians, birds and mammals and emergence and derivatives of ectoderm, mesoderm and endoderm.

DELIVERY METHODS

The course will be delivered through a combination of active learning strategies. These will include:

- PowerPoint lectures and active classroom-based discussion.
- Accompanying lab that confirms and explains lectures' concepts.
- Collaborative learning through dividing each session in the lab to several groups.
- Video lectures.
- E-learning resources: e-reading assignments and practice quizzes through Model and Microsoft Team.

FACULTY INFORMATION

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Office Hours:	

REFERENCES AND LEARNING RESOURCES

Required Textbook:

Gilbert SF and Barresi MJF. 2018. Developmental Biology. 11th edition, Sinauer Associates, Inc., Massachusetts, USA.

Reece JB, Urry LA, Cain ML, Wasserman SA, Minorsky PV and Jackson RB. 2017. Campbell Biology. 11th edition, Pearson, New York, USA.

STUDENT LEARNING OUTCOMES MATRIX*

Core Curriculum Learning Outcomes	Program Learning Outcomes	Course Objectives	Course Student Learning Outcomes	Assessment Method
CC-LO-1 Think critically and creatively in a variety of mechanisms in order to make decisions and understand concepts.	BIOTECH-LO-1: Apply critical thinking and demonstrate problem-solving skills.	1. Develop an understanding of the process of reproduction and fertilization	1.1 Identify the structure of male and female organs. 1.2 Describe the hormonal regulation of male and female reproductive organs. 1.3 Explain the mechanisms underlying fertilization in sea urchin and mammals.	• Exams • Quizzes
		2. Obtain a thorough knowledge about early development of invertebrates.	2. Explain the processes of sea urchin early development.	• Exams • Quizzes • "On-line' reading assignments.
		3. Explore the mechanisms underlying the early development of vertebrates.	3.1 Describe the early stages of amphibian development. 3.2 Elucidate the early stages of bird development. 3.3 Demonstrate the early stages of mammalian development.	• Exams • Quizzes • Homework assignments.

		4. Uncover the derivatives of ectoderm layer.	4.1 Demonstrate the formation of neural tube and elucidate its patterning.	• Exams • Quizzes • "On-line' reading assignments
		5. Explore the derivatives of mesoderm layer.	5.1 Explain the formation of somites as derivatives of paraxial mesoderm. 5.2 Describe the formation of kidneys as derivatives of intermediate mesoderm. 5.3 Elucidate the formation of heart and blood vessels as derivatives of lateral plate mesoderm.	• Exams • Quizzes • "On-line' reading assignments
		6. Demonstrate the derivatives of endoderm layer.	6.1 Demonstrate the mechanisms underlying the formation of digestive and respiratory systems as derivatives of endoderm.	• Exams • Quizzes • "On-line' reading assignments
CC-LO-2. Communicate competently with others using oral and written English skills.	BIOTECH-LO-2: Use modern literature search methods to obtain information about Biotechnology topics.	7. Obtain an understanding of the role of Biotechnology in other disciplines, and its importance in society.	7. Acquire the ability to learn independently; articulate the importance of independent learning for future professional development	• "On-line" reading assignments
CC-LO-3. Demonstrate competency in the use of research skills and various information sources.	BIOTECH-LO-3: Communicate results to biotechnologists and others outside the field.	8. Acquire positive attitudes towards further studies in Biotechnology and towards the application of Biotechnology in other disciplines.	8. Develop a positive attitude towards Biotechnology and its applications in society, and towards further study and lifelong learning.	• "On-line" reading assignments

ACADEMIC SUPPORT

It is The Hashemite University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their instructor to ensure that their individual needs are met. The University through its Special Need section will exert all efforts to accommodate for individual's needs.

Special Needs Section:

Tel:
Location:
Email:

COURSE REGULATIONS

Participation

Class participation and attendance are important elements of every student's learning experience at The Hashemite University, and the student is expected to attend all classes. A student should not miss more than 15% of the classes during a semester. *Those exceeding this limit of 15% will receive a failing grade regardless of their performance*. It is a student's responsibility to monitor the frequency of their own absences. **Attendance record begins on the first day of class irrespective of the period allotted to drop/add and late registration. It is a student's responsibility to sign-in; failure to do so will result in a non-attendance being recorded.**

In exceptional cases, the student, with the instructor's prior permission, could be exempted from attending a class provided that the number of such occasions does not exceed the limit allowed by the University. The instructor will determine the acceptability of an absence for being absent. A student who misses more than 25% of classes and has a valid excuse for being absent will be allowed to withdraw from the course.

Plagiarism

Plagiarism is considered a serious academic offence and can result in your work losing marks or being failed. HU expects its students to adopt and abide by the highest standards of conduct in their interaction with their professors, peers, and the wider University community. As such, a student is expected not to engage in behaviours that compromise his/her own integrity as well as that of the Hashemite University.

Plagiarism includes the following examples and it applies to all student assignments or submitted work:

- **Use of the work, ideas, images or words of someone else without his/her permission or reference to them.**
- **Use of someone else's wording, name, phrase, sentence, paragraph or essay without using quotation marks.**
- **Misrepresentation of the sources that were used.**

The instructor has the right to fail the coursework or deduct marks where plagiarism is detected

Late or Missed Assignments (Reports)

In all cases of assessment, students who fails to attend an exam, class project or deliver a presentation on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a fail grade for this part of the assessment.

- Submitting a term paper on time is a key part of the assessment process. Students who fail to submit their work by the deadline specified will automatically receive a 10% penalty. Assignments handed in more than 24 hours late will receive a further 10% penalty. Each subsequent 24 hours will result in a further 10% penalty.
- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with university regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

Student Complaints Policy

Students at The Hashemite University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

COURSE ASSESSMENT

Course Calendar and Assessment

Students will be graded through the following means of assessment and their final grade will be calculated from the forms of assessment as listed below with their grade weighting taken into account. The criteria for grading are listed at the end of the syllabus

Assessment	Grade Weighting	Deadline Assessment
First Exam	15%	6th or 7th week
Second Exam	15%	11th or 12th week
Laboratory (Reports and Midterm and final exams)	30%	All over the semester
Final Exam	40%	16th or 17th week

Description of Exams

Test questions will predominately come from material presented in the lectures. Semester exams will be conducted during the regularly scheduled lecture period. Exam will consist of a combination of multiple choice, short answer, match, true and false and/or descriptive questions.

Laboratory reports: Will be submitted after the display of laboratory slides.

Laboratory Quizzes: Unannounced quizzes will be given during or/and at the end of any experiment based upon the previous experiments. It will enforce that you come prepared to the lab.

No make-up exams, homework or quizzes will be given. Only documented absences will be considered as per HU guidelines.

Grades are not negotiable and are awarded according to the following criteria*:

Letter Grade	Description	Grade Points
A+	Excellent	4.00
A		3.75
A-		3.50
B+	Very Good	3.25
B		3.00
B-		2.75
C+	Good	2.50
C		2.25
C-		2.00
D+	Pass	1.75
D	Pass	1.50
F	Fail	0.00
I	Incomplete	-

WEEKLY LECTURE SCHEDULE AND CONTENT DISTRIBUTION

"Lecture hours and weeks are approximate and may change as needed"

Week	Weekly hours	Topics	Ch. in Text
1+2	4	**Animal reproductive system** 46.3 Reproductive organs produce and transport gametes. - Human male reproductive anatomy. - Human female reproductive anatomy. - Gametogenesis. 46.4 The interplay of tropic and sex hormones regulates mammalian reproduction.	46 Campbell Biology

		- Hormonal control of the male reproductive system. - Hormonal control of female reproductive cycles.	
3	2	**Fertilization** 47.1 Fertilization in Sea Urchin - The acrosomal reaction. - The cortical reaction. - Egg activation. Internal fertilization in mammals - Getting the gametes into the oviduct: Translocation and capacitation. - In the vicinity of the oocyte: Hyperactivation, thermotaxis, and chemotaxis. - Acrosome reaction and recognition at the zona pellucida. - Gamete fusion and prevention of polyspermy. - Fusion of genetic material. - Activation of mammalian egg.	47 Campbell Biology + 7 develop mental biology
4	2	**Making New Bodies** An overview of early development. - Patterns of cleavage. - Gastrulation: “The most important time in your life”. **Early development in Sea Urchin** Early cleavage in sea urchin - Early cleavage. - Fate maps and the determination of sea urchin blastomeres. Sea Urchin Gastrulation. - Ingression of the skeletogenic mesenchyme. - Invagination of the archenteron.	1 + 10 Develop mental Biology
5+6	4	**Early amphibian Development** Fertilization, cortical rotation, and cleavage. - Unequal radial holoblastic cleavage. - The mid-blastula transition: preparing for gastrulation.	11 Develop mental Biology

		Amphibian Gastrulation. - Vegetal rotation and the invagination of the bottle cells. - Epiboly of the prospective ectoderm. The work of Hans Spemann and Hilde Mangold. - Primary embryonic induction. Molecular mechanisms of amphibian axis formation. - How does the organizer form. - Functions of the organizer. - Induction of neural ectoderm and dorsal mesoderm: BMP inhibitors. The regional specificity of neural induction along the anterior- posterior axis. - The head inducer: Wnt antagonist. - Trunk patterning: Wnt signals and retinoic acid. Specifying the left- right axis.	
7	2	**Early development in birds** Avian cleavage. Gastrulation of the avian embryo. - The hypoblast. - The primitive streak. - Regression of the primitive streak and epiboly of the ectoderm. Axis specification and the avian organizer. - The role of gravity and the PMZ. - Left- right axis formation.	12 Develop mental Biology
8	2	**Early development in mammals** Cleavage. - The unique nature of mammalian cleavage. - Compaction. - Escape from zona pellucida and implantation.	12 Develop mental Biology

		Mammalian gastrulation. - Modifications for development inside another organism. Mammalian axis formation. - The anterior- posterior axis: two signaling centers. - The anterior- posterior patterning by FGF and RA gradients. - The anterior- posterior patterning: The Hox code hypothesis. - The left- right axis. Twins.	
9+10	4	**The vertebrate nervous system and epidermis: Neural tube formation and patterning** Transforming the neural plate into a tube: birth of the central nervous system. - Primary neurulation. - Secondary neurulation. Patterning the central nervous system. - The anterior- posterior axis.	13 Developmental Biology
11	2	**Paraxial mesoderm: The somites and their derivatives** Segmentation of the body plan. Cell types of the somite. Somitogenesis.	17 Developmental Biology
12	2	**Intermediate mesoderm: the kidney** Reciprocal interactions of developing kidney tissues. - Mechanisms of reciprocal induction	18 Developmental Biology
13	2	**Lateral plate mesoderm** The heart - Specification of the heart. - Looping and formation of heart chambers.	18 Developmental Biology

		Blood vessel formation - Vasculogenesis: The initial formation of blood vessels. - Angiogenesis: sprouting of blood vessels and remodeling of vascular beds.	
14	2	**The endoderm: Tubes and organs for digestion and respiration** The endoderm forms the gut and respiratory tubes. The pharynx. The digestive tube and its derivatives. - Specification of the gut tissue. - Accessory organs: The liver, pancreas, and gallbladder. The respiratory tube.	20 Develop mental Biology

ASSESSMENT FABRICS					
Classroom Participation: Assessment Criteria					
Criteria	**Quality**				**Score**
	Excellent (4 points)	**Good (3 points)**	**Satisfactory (2 points)**	**Needs Improvement (1 points)**	
Degree to which student integrates course readings into classroom participation	- often cites from readings; - uses readings to support points; - often articulates "fit" of readings with topic at hand.	-occasionally cites from readings; - sometimes uses readings to support points; -occasionally articulates "fit" of readings with topic at hand.	-rarely able to cite from readings; - rarely uses readings to support points; - rarely articulates "fit" of readings with topic at hand	-unable to cite from readings; -cannot use readings to support points; cannot articulates "fit" of readings with topic at hand.	
Interaction / participation in classroom discussions	-always a willing participant, responds frequently to questions; - routinely volunteers point of view.	-often a willing participant, - responds occasionally to questions; - occasionally volunteers point of view.	-rarely a willing participant, - rarely able to respond to questions; - rarely volunteers point of view.	-never a willing participant., - never able to respond to questions; - never volunteers point of view.	
Interaction /participation in classroom learning activities	-always a willing participant; -acts appropriately during all role plays; - responds frequently to questions; - routinely volunteers point of view.	-often a willing participant; -acts appropriately during role plays; - responds occasionally to questions; -occasionally volunteers point of view.	-rarely a willing participant. -occasionally acts inappropriately during role plays; - rarely able to respond to direct questions; -rarely volunteers point of view.	-never a willing participant - often acts inappropriately during role plays;, - never able to respond to direct questions; - never volunteers point of view.	
Demonstration of professional attitude and demeanor	-always demonstrates commitment through thorough preparation; - always arrives on time; - often solicits instructors' perspective outside class.	- rarely unprepared; rarely arrives late; - occasionally solicits instructors' perspective outside class.	-often unprepared; occasionally arrives late; - rarely solicits instructors' perspective outside class.	-rarely prepared; - often arrives late; -never solicits instructors' perspective outside class	