

Course ID:	Course Title:	Fall 2023
BIO 338	Developmental Biology	Prerequisite: BIO 211, BIO 231, and BCH 297
		Credits: 3

Class Information		Instructor Information		Important Dates	
Delivery:	In Class	Instructor:	Dr. Chris Wang	First Day of Class:	January 9, 2023
Days:	Tuesday and Thursday	Email:	chris.wang@ambrose.edu	Last Day to Add/Drop:	January 22, 2023
Time:	8:15 – 9:30 A.M.	Phone:	(403) 410-2000 ext. 6910	Last Day to Withdraw:	March 31, 2023
Room:	L2100	Office:	L2113	Last Day to Apply for Coursework Extension:	April 3, 2023
Tutorial:	Time: 4:00 – 5:15 P.M. Date: Thursday Location: A1085-1	Office Hours:	by appointment (open door policy)	Last Day of Class:	April 14, 2023
Final Exam:	Time: 9 A.M. – 12 P.M. Date: Thursday, April 20 Location: L2100				

Important Dates and Information:

For a list of all important dates and information regarding participating in classes at Ambrose University, please refer to the Academic Calendar at <https://ambrose.edu/academic-calendar>.

Course Description

An introduction to basic principles in vertebrate and invertebrate development. Students will study the intra- and intercellular processes that regulate cellular proliferation and differentiation. Topics include mechanisms controlling embryonic development, pattern formation, morphogenesis, and cellular differentiation in selected model organisms.

Expected Learning Outcomes

Students who successfully complete this course will be able to:

- describe and explain the general concepts and features of development (specification, differentiation, morphogenesis) that are common to most types of animal
- describe the characteristics of major experimental model organisms

- identify and define the major stages in the development of model organisms
- identify embryonic structures, such as germ layers and the tissues/organs that develop from each germ layer
- describe mechanisms by which embryonic cells communicate and their role in regulating embryonic development
- describe and apply the theory of selected molecular techniques used in the field of developmental biology to real-world scenarios
- describe the mechanism of gene expression regulation and explain their importance in controlling developmental processes
- apply the principles learned in class to explain the development of complex, multicellular organisms from unicellular organisms
- apply the knowledge learned in class to fields of medical sciences, such as tissue/organ regeneration, and stem cell and gene therapy

Textbooks

Required: Scott Gilbert and Michael Barresi. *Developmental Biology*. Twelfth Edition. Published by Oxford University Press.

The etextbook can be purchased from Willow Lab and the subscription link is posted on Moodle.

Recommended: Angelika H. Hofmann. 2022. *Writing in the Biological Sciences*. 4th Edition. Published by Oxford University Press.

Tentative Course Schedule

The following schedule provides a general guideline and timetable for topics and tests. It may change depending on the progress throughout the semester.

Date	Lecture Topic	Readings (Gilbert's 12 th Ed)
	Tutorial of the Week	
Jan. 10	Introduction to BIO 338	
Jan. 12	Topic 1 - Introduction to the Study of Developmental Biology	Ch. 1
	Tutorial 1 - Personhood <ul style="list-style-type: none"> ▪ pre-tutorial: watch the Dev Tutorial 1.1: Personhood video (https://vimeo.com/143911991) ▪ in-tutorial: discussion on the Personhood case study 	
Jan. 17	Topic 2 - Cell Specification during Development	Ch. 2
Jan. 19	Topic 3 - Differential Gene Expression in Development	Ch. 3
	Tutorial 2 – Basic Tools for Developmental Biology <ul style="list-style-type: none"> ▪ in-tutorial: mini-lecture on the Basic Tools of Developmental Biology ▪ resources: Further Development 3.17: Techniques of RNA and DNA Analysis (https://learninglink.oup.com/access/content/barresi-12e-student-resources/barresi-12e-further-development-3-17-techniques-of-rna-and-dna-analysis?previousFilter=tag_chapter-03) 	

Jan. 24	Topic 3 - Differential Gene Expression in Development	Ch. 3
Jan. 26	No Lecture due to Program Day	
	No Tutorial due to Program Day	
Jan. 31	Topic 3 - Differential Gene Expression in Development	Ch. 3
Feb. 02	Topic 4 - Cell-to-Cell Communication in Development	Ch. 4
	Tutorial 3 – Differential Gene Expression in Development ▪ pre-tutorial: watch the Dev Tutorial 3.1: Differential Gene Expression video (https://vimeo.com/145415821) ▪ in-tutorial: A Heart Hole-ding Hand case study	
Feb. 07	Topic 4 - Cell-to-Cell Communication in Development	Ch. 4
Feb. 09	Topic 4 - Cell-to-Cell Communication in Development	Ch. 4
	Tutorial 4 – Morphogen Signaling ▪ pre-tutorial: watch the Dev Tutorial 4.1: Morphogen Signaling video (https://vimeo.com/145533130) ▪ in-tutorial: Two Heads Are Better Than One case study	
Feb. 14	Topic 5 - Stem Cells ▪ Stem Cell Basic (https://vimeo.com/145434103)	Ch. 5
Feb. 16	Topic 5 - Stem Cells Topic 6 - Early <i>Drosophila</i> Development	Ch. 5 Ch. 8 and 9
	Tutorial 5 – <i>C. elegans</i> Development ▪ in-tutorial: mini-lecture on <i>C. elegans</i> Development	
Feb. 21	No Lecture Due to Winter Reading Week	
Feb. 23	No Lecture Due to Winter Reading Week	
	No Tutorial Due to Winter Reading Week	
Feb. 28	Topic 6 - Early <i>Drosophila</i> Development	Ch. 8 and 9
Mar. 02	In-Class Midterm 1	
	Tutorial 6 – Axis Specification in <i>Drosophila</i> and Report Rubric Discussion ▪ The Genetics of Axis Specification in <i>Drosophila</i> video (https://www.youtube.com/watch?v=NcxS21KEj0g)	
Mar. 07	Topic 7 - External Fertilization and Early Development in Amphibians	Ch. 7 and 11
Mar. 09	Topic 7 - External Fertilization and Early Development in Amphibians	Ch. 7 and 11
	Tutorial 7 – Gastrulation and Term Paper Reviewing Session ▪ Find It, Lose It, Move It video (https://vimeo.com/136532431) ▪ Gastrulation video (https://vimeo.com/142142229)	
Mar. 14	Topic 7 - External Fertilization and Early Development in Amphibians Topic 8 - Internal Fertilization and Early Development in Mammals	Ch. 7 and 11 Ch. 7 and 12
Mar. 16	Topic 8 - Internal Fertilization and Early Development in Mammals	Ch. 7 and 12
	Tutorial 8 – Gametes and Term Paper Reviewing Session ▪ Legends of the Sperm and Egg video (https://vimeo.com/136521260)	

Mar. 21	Topic 8 - Internal Fertilization and Early Development in Mammals	Ch. 7 and 12
Mar. 23	Topic 9 - Ectoderm Development – The Vertebrate Nervous System	Ch. 13
Mar. 26	Tutorial 9 – Neural Development and Term Paper Reviewing Session ▪ Neurulation video (https://vimeo.com/177232192) ▪ Neural Crest Developmen video (https://vimeo.com/180594490)	
Mar. 28	Topic 9 - Ectoderm Development – The Vertebrate Nervous System	Ch. 13
Mar. 30	Topic 10 - Ectoderm Development - Brain Development	Ch. 14
	Tutorial 10 – Body Segments and Term Paper Reviewing Session ▪ Somitogenesis video (https://vimeo.com/185318806)	
Apr. 04	Topic 10 - Ectoderm Development - Brain Development	Ch. 14
Apr. 06	Topic 11 - Intermediate Mesoderm Development – Sex Determination and Gametogenesis	Ch. 6
	Tutorial 11 – Mammalian Sex Determination ▪ Mammalian Sex Determination video (https://vimeo.com/161192136)	
Apr. 11	Topic 11 - Intermediate Mesoderm Development – Sex Determination and Gametogenesis	Ch. 6
	Topic 12 - Later Plate Mesoderm Development – Heart and Circulatory System	Ch. 18
Apr. 13	Topic 13 - Endoderm Development – Tubes and Organs for Digestion and Respiration Final Research Proposal Due	Ch. 20
	Tutorial 12 – Final Exam Q & A Session	

Attendance:

- lecture attendance is not required. However, students, who absent from lecture(s), are responsible for the course materials covered.
- doctor's notes are required for deferred midterm and final exams

Evaluation Methods:

Evaluation Methods	Due Date	Weighting
Critique Paper	February 28 th	20%
Review Paper	April 3 rd	25%
Midterm	March 2 nd	25%
Final Exam (cumulative)	Time: 9 A.M. – 12 P.M. Date: Thursday, April 20 Location: L2100	30%
Total		100%

Critique Paper:

- please see the “Critique Scientific Research Articles Guideline” posted on Moodle
- the critique paper is due on **Feb. 28th**

Review Paper:

- topic selection:
 - this is an individual work
 - choose a topic of “your” interest using FGFR3 as an example and get an approval from the instructor
 - topic selection is due on **Feb. 1st**
- criteria:
 - a draft copy of the review article should be submitted and circulated by **March 10th**
 - in tutorial sessions 7 to 10, each student critiques drafts from 2 other peers, and provides a written reviewer’s comments for revisions
 - 10-15 double-spaced pages in font size of 11-12, and minimum of 10 primary research articles cited (NO online references allowed)
 - at the end, submit the final review article with reviewers’ notes on **April 3rd**
- grading rubric:
 - students will come up with a marking rubric by, in agreement with the instructor, by **March 2nd**
 - the rubric should include, but not limited to, relevance and background information of the research topic, flow and logic of the proposal, quality and appropriateness of experimental design and methodology, the conclusions that could be drawn from the experiments, and the literature citation

Grade Summary:

Percent (%) to Letter Grade Conversion	Grade	Grade Point	Description
92.00% - 100%	A+	4.0	Excellent
85.00% - 91.99%	A	4.0	
80.00% - 84.99%	A-	3.7	
77.00% - 79.99%	B+	3.3	Good
73.00% - 76.99%	B	3.0	
70.00% - 72.99%	B-	2.7	
67.00% - 69.99%	C+	2.3	Satisfactory
63.00% - 66.99%	C	2.0	
60.00% - 62.99%	C-	1.7	
55.00% - 59.99%	D+	1.3	
50.00% - 54.99%	D	1.0	Minimal Pass
00.00% - 49.99%	F	0	Fail

Because of the nature of the Alpha 4.00 system, there can be no uniform University-wide conversion scale. The relationship between raw scores (e.g. percentages) and the resultant letter grade will depend on the nature of the course and the instructor’s assessment of the level of each class, compared to similar classes taught previously.

Please note that final grades will be available on student registration system. Printed grade sheets are not mailed out.

Other:

Classroom Etiquette:

Electronic Devices

Although computers and tablets can be used in the class for taking lecture notes. Please turn off the ring tone of cellular phone - it is very distracting to hear someone's phone go off in class. Texting and movie watching are prohibited in class.

Attend every class

You will find that students who attend every class, listen to the instructor and take good notes will be more likely to pass (with a higher grade). If you have an emergency or illness, please contact me ahead of time to let me know that you will be absent.

Important note: if you miss a class it is your responsibility to make up the missed work.

Get to Class On Time

Students, who walk into the classroom late or leave early, distract other students and disrupt the learning environment.

Do Not Have Private Conversations

The noise is distracting to other students. Also, talking to classmates during lecture and presentations disrupts the normal learning environment.

Do Not Get Up and Walk Out Halfway Through the Class

It disturbs people and gives the unmistakable impression that you don't respect the class, the other students or the instructor. The instructor has the right to finish his or her thought at the end of the class period and conclude the class in an orderly fashion without people standing up and walking out

Your Classmates Deserve Your Respect and Support

Others may have different ideas and opinions from yours, they may ask questions you perceive to be "stupid," but they deserve the same level of respect from you as you wish from them.

Plagiarism:

Plagiarism is a very serious academic offence that involves presenting work in a course as if it were the result of one's own study and investigation when, in fact, it is the work of someone else. Plagiarism takes place when:

- an essay or other work is copied from another source, including your peer's work, and submitted as one's own
- parts of a work, including words, ideas, images or data, are taken from a source without acknowledgement of the originator
- work presented for one course is also submitted for another course without prior agreement of the instructors involved
- another person prepares the work that is submitted as one's own
- substantial editorial or compositional assistance from another person is received on work that is submitted as one's own

Cheating:

Cheating is also a very serious academic offence. Cheating on examinations, assignments and/or labs may take a number of forms, including:

- tampering or attempting to tamper with examination scripts, class work, grades or class records
- obtaining unauthorized assistance from anyone during the course of an examination
- impersonating another student during examinations
- falsifying or fabricating lab reports
- communicating with other students during an examination
- bringing unauthorized written material or electronic devices to an examination
- possessing, distributing, or attempting to possess or distribute unauthorized material in respect to examinations
- attempting to read the examination papers of other students
- deliberately exposing one's own examination papers to another student

Ambrose University Academic Policies:

Communication

All students have received an Ambrose e-mail account upon registration. It is the student's responsibility to check this account regularly as the Ambrose email system will be the professor's instrument for notifying students of important matters (cancelled class sessions, extensions, requested appointments, etc.) between class sessions. If students do not wish to use their Ambrose accounts, they will need to forward all messages from the Ambrose account to another personal account.

Registration

During the **Registration Revision Period** students may enter a course without permission, change the designation of any class from credit to audit and /or voluntary withdraw from a course without financial or academic penalty or record. Courses should be added or dropped on the student portal by the deadline date; please consult the List of Important Dates. After that date, the original status remains and the student is responsible for related fees.

Students intending to withdraw from a course after the Registration Revision Period must apply to the Office of the Registrar by submitting a "Request to Withdraw from a Course" form or by sending an email to the Registrar's Office by the **Withdrawal Deadline**; please consult the List of Important Dates on the my.ambrose.edu website. Students will not receive a tuition refund for courses from which they withdraw after the Registration Revision period. A grade of "W" will appear on their transcript.

Students wishing to withdraw from a course, but who fail to do so by the applicable date, will receive the grade earned in accordance with the course syllabus. A student obliged to withdraw from a course after the Withdrawal Deadline because of health or other reasons may apply to the Registrar for special consideration.

Exam Scheduling

Students, who find a conflict in their exam schedule must submit a Revised Examination Request form to the Registrar's Office by the

deadline date; please consult the List of Important Dates. Requests will be considered for the following reasons only: 1) the scheduled final examination slot conflicts with another exam; 2) the student has three final exams within three consecutive exam time blocks; 3) the scheduled final exam slot conflicts with an exam at another institution; 4) extenuating circumstances. Travel is not considered a valid excuse for re-scheduling or missing a final exam.

Electronic Etiquette

Students are expected to treat their instructor, guest speakers, and fellow students with respect. It is disruptive to the learning goals of a course or seminar and disrespectful to fellow students and the instructor to use electronics for purposes unrelated to the course during a class session. Turn off all cell phones and other electronic devices during class. Laptops should be used for class-related purposes only. Do not use iPods, MP3 players, or headphones. Do not text, read, or send personal emails, go on Facebook or other social networks, search the internet, or play computer games during class. Some professors will not allow the use of any electronic devices in class. The professor has the right to disallow the student to use a laptop in future lectures and/or to ask a student to withdraw from the session if s/he does not comply with this policy. Repeat offenders will be directed to the Dean. If you are expecting communication due to an emergency, please speak with the professor before the class begins.

Academic Policies

It is the responsibility of all students to become familiar with and adhere to academic policies as stated in the Academic Calendar. Personal information (information about an individual that may be used to identify that individual) may be required as part of taking this class. Any information collected will only be used and disclosed for the purpose for which the collection was intended. For further information contact the Privacy Compliance Officer at privacy@ambrose.edu.

Extensions

Although extensions to coursework in the semester are at the discretion of the instructor, students may not turn in coursework for evaluation after the last day of the scheduled final examination period unless they have received permission for a course Extension from the Registrar's Office. Requests for course extensions or alternative examination time must be submitted to the Registrar's Office by the deadline date; please consult the List of Important Dates. Course extensions are only granted for serious issues that arise "due to circumstances beyond the student's control."

Appeal of Grade

An appeal for change of grade on any course work must be made to the course instructor within one week of receiving notification of the grade. An appeal for change of final grade must be submitted to the Registrar's Office in writing and providing the basis for appeal within 30 days of receiving notification of the final grade, providing the basis for appeal. A review fee of \$50.00 must accompany the appeal. If the appeal is sustained, the fee will be refunded.

Academic Integrity

We are committed to fostering personal integrity and will not overlook breaches of integrity such as plagiarism and cheating. Academic dishonesty is taken seriously at Ambrose University as it undermines our academic standards and affects the integrity of each member of our learning community. Any attempt to obtain credit for academic work through fraudulent, deceptive, or dishonest means is academic dishonesty. Plagiarism involves presenting someone else's ideas, words, or work as one's own. Plagiarism is fraud and theft, but plagiarism can also occur by accident when a student fails or forgets to acknowledge to another person's ideas or words. Plagiarism and cheating can result in a failing grade for an assignment, for the course, or immediate dismissal from the university. Students are expected to be familiar with the policies in the current Academic Calendar that deal with plagiarism, cheating, and the penalties and procedures for dealing with these matters. All cases of academic dishonesty are reported to the Academic Dean and become part of the student's permanent record.

Note: Students are strongly advised to retain this syllabus for their records.