

# Biology of Development

---

Course Syllabus  
BIOB 301 CRN 73477  
T/Th 11:00 AM-12:20 PM ISB110

**Instructor:** Ekaterina Voronina  
Office: ISB Rm 217  
Office Hours: by appointment  
email: [ekaterina.voronina@umontana.edu](mailto:ekaterina.voronina@umontana.edu)

**Teaching Assistant:** Lewis Sherer  
email: [lewis.sherer@umconnect.umt.edu](mailto:lewis.sherer@umconnect.umt.edu)

**Prerequisites:** BIO 221 (required) BIO 223 (recommended)

The material in this course assumes a basic understanding of cellular processes, including: mitosis and meiosis, DNA translation and transcription, and principles of eukaryotic gene expression, at the level covered in a general introductory biology text. Please ask if you have questions about your previous coursework or preparation for this course.

**Course book:** Scott F. Gilbert *Developmental Biology*, 10<sup>th</sup> edition (available in hardback and electronic versions) Sinauer Associates: Sunderland MA

Supplemental material will be available through the course website in advance of class. The students are responsible for obtaining the copies of these articles in a timely fashion.

The course examines major cellular, molecular and genetic mechanisms of animal embryogenesis. Topics include gamete interactions, establishment of body plan, cell signaling, developmental regulation of gene expression, experimental approaches to analysis of embryonic development, evolutionary conservation of developmental strategies. Students will be able to explain each of these concepts using examples from a range of organisms. The course emphasizes experimental approach to analyze mechanisms of development. Students will be able to analyze data regarding mechanisms governing development and design experiments to solve novel problems. Relevance to biotechnological applications, disease, social context and ethical issues will be discussed, including connection between mechanisms of normal development and disease etiology. Both invertebrate and vertebrate model systems will be covered, including *Drosophila*, *C. elegans*, frog, zebrafish, mice and human.

Course materials (including updates, supplements, and assignments) are available through the BIOB 301 Moodle page

Students who experience disability-related barriers may request reasonable modifications by contacting Prof. Voronina and should register with Disability Services (<http://www.umt.edu/dss/>). If students elect to use approved academic adjustments, they must provide an advance formal notification from Disability Services to the instructor.

## Course Schedule

**Note: lecture topics subject to change to align with students' progress; however, assignment due dates and exam dates will remain as scheduled.**

	Date	Topic	Reading
1	Aug 30	Introduction to animal development. Body plan. Life Cycle <b>Pre-Assessment</b>	Ch, 1 (p5-17)
2	Sept 1	Experimental study of development and developmental genetics	Ch. 1 (p27-28); handout, p32 box
3	Sept 6	Differential gene expression - anatomy of a gene, transcription, transcription factors, RNA splicing	Ch. 2 (p31, 34-48; 53-65)
4	Sept 8	Cell signaling, communication and patterning	Ch. 3; p107-108
5	Sept 13	Sex determination	Ch. 15
6	Sept 15	Germ cell specification and migration	Ch. 17 (p591-606)
7	Sept 20	Meiosis. Spermatogenesis	Ch. 17 (p606-623), Ch. 4
8	Sept 22	Oogenesis	(118-124)
9	Sept 23	Fertilization. Sperm-egg recognition. Cell signaling. Blocks to polyspermy.	Ch. 4 (p126-151)
10	Sept 27	<b>Exam I (covers material up to Sept 23)</b>	
11	Sept 29	Cell division. Fate mapping. Maternal determinants. Partitioning the determinants: asymmetric cell division	Ch. 1(19-23), Ch. 5(153-158; 170-173), Ch. 7(217-220)
12	Oct 4	<i>Drosophila</i> early development: gradients determining positional information.	Ch. 6 (180-182, 194-201)
13	Oct 6	Maternal contribution: localized mRNAs in <i>Drosophila</i> oocyte. Dorsal-ventral patterning	Ch. 6 (p186-191)
14	Oct 11	Differential gene expression in development: promoter analysis	Ch. 1 (p37-48)
15	Oct 13	Genetics of axis specification. Interpretation of positional information. Segmentation and homeobox genes.	Ch. 6 (p202-213)
16	Oct 18	Gastrulation: separating germ layers. Cell fates, cell motility and shape change.	Ch. 7 (p225-231), Ch. 8 (241-250)
17	Oct 20	Amphibian patterning: signaling, cell-cell interactions. Spemann organizer. <b>Essay Due</b>	Ch. 8 (p251-270)
18	Oct 25	Gastrulation in birds and mammals	Ch. 9
19	Oct 27	Neurulation	Ch. 10 (p333-355)
20	Nov 1	<b>Exam II (covers material up to Oct 27)</b>	
	Nov 3	Eye development	Ch. 10 (p359-367)
21	Nov 8	<b>Election Day - No Class</b>	
	Nov 10	Neural Crest Cells	Ch. 11
22	Nov 15	Imaginal disc patterning in <i>Drosophila</i> .	Ch. 16 (p558-563)
23	Nov 17	Vertebrate limb formation	Ch. 14
24	Nov 22	Postembryonic development. Regeneration and aging.	Ch. 16 (p568-587)
25	Nov 24	<b>Thanksgiving Break - No Class</b>	
	Nov 29	Stem cells, units of development and regeneration	p. 319-331
26	Dec 1	Cloning and reprogramming	p. 32, 46
27	Dec 6	Current issues in developmental biology	
	Dec 8	<b>REVIEW; Post-Assessment</b>	
	Dec 14	<b>10:10-12:10 Final Exam</b>	

Ihr habt den Weg vom Wurm zum Menschen gemacht, und Vieles ist in euch noch Wurm.

(You have made your way from worm to man, and much within you is still worm.)

Friedrich Nietzsche, 1883, from *Also Sprach Zarathustra*

## Examinations and Assignments

There will be one **essay**, fifteen **in-class written assignments**, two **in-class exams**, and one **final exam**. The essay will be a 1-2 page analysis of one figure from a research article in developmental biology. In-class assignments will be problem solving in a written format, each assignment will be worth 10 points, up to the total of 100 points. Exams will be in class; each will include a combination of question formats. Final exam will be cumulative for the entire semester.

## Grading

Grades for the course will be assigned based on the cumulative performance and not based on a curve. **A** indicates that the work is markedly superior and is without major problems.

**B** indicates that the work has met all of the requirements of the assignment or course at a level that is above average, and that the student has met most of the goals.

**C** indicates satisfactory work that is consistently average and that meets the course goals in a sufficient level to pass, even though there may be some problems with the work.

**NC** indicates that the failure to complete the course or assignments, or work that is below the standard required for awarding the credit.

Grade breakdown:

Pre-test	10 pts
Post-test	10 pts
Essay	30 pts
In-class assignments	100 pts
In class Exam 1	100 pts
In class Exam 2	100 pts
<u>Final Exam</u>	<u>100 pts</u>
Total	450 pts

## Academic Code

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at

[http://www.umt.edu/vpsa/policies/student\\_conduct.php](http://www.umt.edu/vpsa/policies/student_conduct.php)