Term Information

Effective Term	Spring 2018

General Information

Course Bulletin Listing/Subject Area	Molecular Genetics
Fiscal Unit/Academic Org	Molecular Genetics - D0340
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	4700
Course Title	Molecular Cell and Developmental Biology
Transcript Abbreviation	MolCellDevBiol
Course Description	A genetics-based introduction to the structure and function of cells and the early development of invertebrates and vertebrates, with a special focus on the molecular mechanisms underpinning cellular biology and development.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 7 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Completion of MOLGEN4500 (500) or MOLGEN4606 (606) or instructor permission
Exclusions	Exclude students with a grade of C- or above in MOLGEN5607 or MOLGEN5608 Students with a grade of C- or lower in MOLGEN5607 or MOLGEN5608 can enroll with instructor permission
Electronically Enforced	Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	26.0804
Subsidy Level	Baccalaureate Course
Intended Rank	Junior, Senior

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- • Understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, including macromolecules, membranes, and organelles
- • Understand the cellular components and regulatory pathways underlying cell division.
- • Understand how cytoskeletal components contribute to cellular functions
- • Understand how cellular components are targeted and distributed to different regions and compartments of a cell
- • Understand and master basic concepts of developmental biology including fertilization, cleavage and gastrulation
- • Understand the roles of inductive signals in development
- • Apply basic concepts of gene expression and regulation and cell:cell communication to their understanding of cell and developmental biology
- • Apply their knowledge of cell and developmental biology to interpret or predict the outcomes of alterations in cell function, including responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

Content Topic List

- Membrane structure and transport
  - Organelles and intracellular compartments
  - Protein trafficking
  - Cellular communication
  - Apoptosis and cancer
  - Cell biology techniques
- Nuclear organization
  - The cytoskeleton
  - Cell cycle, mitosis, cytokinesis and apoptosis
- Introduction to developmental biology and experimental embryology
  - Use of genetic model systems in understanding development of invertebrates, vertebrates, and plants
- Cell fate determination
  - Stem cell biology
  - Cell-cell signaling
  - Cell adhesion, organized cell movements, and morphogenesis
  - Gastrulation and generation of the germ layers
  - Neurulation and development of the nervous system
- Morphogens and pattern formation
  - Cancer cell biology
  - Germ cell, fertilization and cloning
  - Development, differentiation and patterning

Sought Concurrence

Yes

Attachments

- Draft_Syllabus_MolCell&Dev_4700.doc: Syllabus

  (Syllabus. Owner: Vaessin,Harald Emil Friedrich)

- Concurrence_Form_MOLGEN4700.jpg: Concurrence from EEOB

  (Concurrence. Owner: Vaessin,Harald Emil Friedrich)

- Departmental_Letter_for_MOLGEN4700_course_request_.docx: Cover Letter

  (Cover Letter. Owner: Vaessin,Harald Emil Friedrich)

- MolGenCurriculumMapwith4700.pdf: Curriculum Map MolGen

  (Other Supporting Documentation. Owner: Vaessin,Harald Emil Friedrich)

Comments

- Concurrence was requested and received from EEOB. *(by Vaessin,Harald Emil Friedrich on 05/05/2017 10:43 AM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Vaessin,Harald Emil Friedrich	05/05/2017 09:48 PM	Submitted for Approval
Approved	Vaessin,Harald Emil Friedrich	05/05/2017 09:53 PM	Unit Approval
Approved	Haddad,Deborah Moore	05/06/2017 05:39 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	05/06/2017 05:39 PM	ASCCAO Approval

THE OHIO STATE UNIVERSITY

Department of Molecular Genetics

Susan E. Cole
209 Biological Sciences Building
484 W. 12th Ave.
Columbus, OH 43210

614-292-3276 Phone
614-292-4466 Fax

cole.354@osu.edu

April 30, 2017

Dear Members of the ASCC,

The Department of Molecular Genetics is requesting the creation of a new course, to be titled "MOLGEN4700: Molecular Cell and Developmental Biology". This course will provide genetics-based introduction to the structure and function of cells and to early development of invertebrates and vertebrates, with a special focus on the molecular mechanisms underpinning cellular biology and development.

The rationales for this new course are to streamline student pathways to the MOLGEN minor, provide support for students in the MOLGEN major, and to expand opportunities for students across the biological sciences to explore the critically important topics of cell and developmental biology while providing instruction in these areas at multiple levels of complexity that are appropriate for different audiences.

Currently, most medical schools and many graduate programs expect students will have training in cell biology. On the main OSU campus, students currently have two options to take a cell biology course:

EEOB3510: Cellular and Developmental Biology is a 3 credit hour course which requires prior coursework in evolutionary biology.

MOLGEN5607 is a 3 credit hour, cell biology focused class which requires prior coursework in Genetics (MolGen4500 or MolGen 4606), and is aimed predominantly at MolGen majors.

Both of these courses are offered in the Fall.

We propose this course to address curricular concerns in the Molecular Genetics major and minor sequences, but expect that the proposed course will be appropriate for students from other majors who plan to matriculate in medical school, dental school, or a molecularly focused graduate program. This course fulfills unmet needs providing a single, genetics based course that offers instruction with emphases on both cellular biology and developmental biology within a molecular framework and by providing cell biology coursework in the spring.

We envision 4 potential audiences for such a course who are underserved at this time.

1) Students in the Molecular Genetics minor track. Students in the minor currently take MOLGEN4500 or 4606 and at least 2 of MOLGEN5607 (Cell biology) 5608 (Developmental Biology) or MOLGEN5645 (Quantitative, Population, and Evolutionary Genetics). The existence of a single course that addresses both cell and developmental biology will provide alternate paths through the minor that allow interested students to take an additional elective outside of the required core courses.

2) Students in the Molecular Genetics major track who require additional support to be successful in the major. Our analysis of past student outcomes indicates that students who struggle in MOLGEN4606 struggle in later courses in the core. We envision that students who require additional support could be identified based on performance in MOLGEN4606 and then could be encouraged by their advisors to take MOLGEN4700 prior to attempting MolGen5607 or MOLGEN5608. Depending on performance in MOLGEN4700, these students could either choose to seek another major (but would be able to continue a minor in MOLGEN without

needing to take MOLGEN 5607 or MOLGEN 5608) or continue on to MOLGEN5607 and MOLGEN5608 with the additional background that our prior analysis suggests will support their success in the major coursework at the 5000 level.

3) A subset of students may desire a genetics-based course in cell/developmental biology, but not desire a course designed for Molecular Genetics majors. These students may be more appropriately served by a 4000 level course that addresses both cellular and developmental biology

4) The existence of cell/developmental biology course in the Spring semester will afford students in the biological sciences increased flexibility as they complete a pre-med or other pre-health curriculum.

Sincerely,

Susan Cole, Ph.D.
Associate Chair of Molecular Genetics

DRAFT!

Molecular Cell and Developmental Biology
MOLGEN 4700
Spring semester, Lecture course, 3 credits
Days/times TBA
Location TBA

Instructor: TBA
Address TBA
phone TBA
Email TBA

Office Hours
TBA

Course Description
From the course bulletin: A genetics-based introduction to the structure and function of cells and the early development of invertebrates and vertebrates, with a special focus on the molecular mechanisms underpinning cellular biology and development.
Prerequisites: Successful completion of MOLGEN 4500 or MOLGEN 4606 or instructor permission.

Learning Outcomes
Upon completion of this course students will:

- Understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, including macromolecules, membranes, and organelles
- Understand the cellular components and regulatory pathways underlying cell division.
- Understand how cytoskeletal components contribute to cellular functions
- Understand how components are targeted and distributed to different cellular regions and compartments
- Understand and master concepts of development including fertilization, cleavage and gastrulation
- Understand the roles of inductive signals in development
- Apply basic concepts of gene expression and regulation and cell:cell communication to their understanding of cell and developmental biology
- Apply knowledge of cell and developmental biology to interpret or predict the outcomes of alterations in cell function. These may include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

Required Textbooks

Alberts et al, Molecular Biology of the Cell, 6th Ed,
ISBN-10: 978-0815345244; ISBN-13: 0815345240;

Additional readings from Gilbert, Developmental Biology, 6th Ed,
(https://www.ncbi.nlm.nih.gov/books/NBK9983) and WIRES Developmental Biology (available online) will be used for developmental biology

Course website

https://carmen.osu.edu
Notes and supplemental materials will be available on this website.
Note packets including major figures used during lectures will be posted prior to lectures.

Attendance
Attendance will not be enforced, nor will attendance be taken. However, attendance at lectures is both expected, and essential to an understanding of the material. All other available resources, including assigned readings and posted lecture slides, are intended to supplement the lectures, and not as a substitute for attendance. Likewise, note packets including lecture slides are not intended as a substitute for your own note taking during lecture, and posted slides will not contain all of the pertinent information from lecture.

Grading information
Your course grade will be based on the following components:

Weekly in class quizzes/activities (10 pts each, drop lowest 4)	100 pts
Two midterm exams (100 pts each)	200 pts
Cumulative final exam (150 pts)	150 pts
	450 pts total

Grading scale
Final grades will be based on your final percentage [(points accumulated/ 450 total points for the course) x 100)]. Generally, the final grades assigned will reflect the OSU Standard grade scheme, however, the instructor reserves the right to adjust the lower limits for each grade category downwards if justified by overall class performance (i.e., a 90 % is guaranteed to receive an A-, but in some cases an A- may be assigned for a performance below 90%).

Statement on Academic Misconduct
"It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/."

The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct. Suspected cases of academic misconduct will be reported to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct, the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact the instructor

Student Accommodations

"Students with disabilities that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 098 Baker Hall, 113 W 12th Ave; 614-292-3307 Office / 614-429-1334 VRS / 614-292-4190 Fax
Web: slds.osu.edu."

TENTATIVE SCHEDULE

Note that an in-class quiz or activity will take place each week. These activities are worth 100 points, or ~25% of your grade as described above

	TOPICS	**READING**
WEEK 1	Introduction to cell structure, compartmentalization, and membranes	Alberts, Chapters 10 and 11
WEEK 2	Protein synthesis and import; critical techniques in cell biology.	Alberts, Chapters 9 and 12
WEEK 3	Protein processing and vesicular trafficking	Alberts, Chapters 6 and 13
WEEK 4	Secretion, endocytosis, and plant organelles	Alberts, Chapters 13 and 14
WEEK 5	Nuclear function and nucleocytoplasmic trafficking	Alberts, Chapters 4 and 13
	MIDTERM 1 FRIDAY OF WEEK 5	
WEEK 6	The cytoskeleton	Alberts, Chapters 16
WEEK 7	Mitosis and Cytokinesis; the cell biology of plants	Alberts, Chapters 17
WEEK 8	Cell signaling and cancer	Alberts, Chapters 15 and 20
WEEK 9	Introduction to developmental biology. Basic concepts of embryogenesis	https://www.ncbi.nlm.nih.gov/books/NBK10111/ https://www.ncbi.nlm.nih.gov/books/NBK9974/ https://www.ncbi.nlm.nih.gov/books/NBK10002/
WEEK 10	Fertilization, cleavage and gastrulation	https://www.ncbi.nlm.nih.gov/books/NBK9992/
	MIDTERM 2 FRIDAY OF WEEK 10	
WEEK 11	Early embryo patterning and axis establishment	http://onlinelibrary.wiley.com/doi/10.1002/wdev.144/full http://onlinelibrary.wiley.com/doi/10.1002/wdev.25/full
WEEK 12	Mesoderm induction	https://www.ncbi.nlm.nih.gov/books/NBK9993/ https://www.ncbi.nlm.nih.gov/books/NBK10101/ http://onlinelibrary.wiley.com/doi/10.1002/wdev.217/full
WEEK 13	Neurulation, neural induction, and neural crest cells	http://onlinelibrary.wiley.com/doi/10.1002/wdev.90/full https://www.ncbi.nlm.nih.gov/books/NBK10065/
WEEK 14	Stem cells	Alberts, Chapter 22

FINAL EXAM: Cumulative exam covering both cell and developmental biology (150 points). As scheduled by the Registrar.

The Ohio State University
College of the Arts and Sciences Concurrence Form

The purpose of this form is to provide a simple system of obtaining departmental reactions to course requests. **An e-mail may be substituted for this form.**

An academic unit initiating a request should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Units should be allowed two weeks to respond to requests for concurrence.

Academic units receiving this form should respond to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before this form and all other accompanying documentation may be forwarded to the Office of Academic Affairs.

A. Proposal to review

Molecular Genetics	MOLGEN4700 Molecular cell and developmental biology
Initiating Academic Unit	Course Number / Course Title

New	4/26/2017
Type of Proposal (New, Change, Withdrawal, or other)	Date request sent

Evolution, Ecology, and Organismal Biology	
Academic Unit Asked to Review	Date response needed

B. Response from the Academic Unit reviewing

Response: include a reaction to the proposal, including a statement of support or non-support (continued on the back of this form or a separate sheet, if necessary).

We support the creation of this new course. The focus of our similar course, EEOB 3510, is on cell and developmental biology as it relates to the whole organism as a system, and the driving forces behind the current structures. Among other student populations, EEOB 3510 serves the Biomedical Engineering majors, who require a course from the organismal perspective. Thus, I think there will be little overlap in student demand and sufficient difference in content to justify adding the new course.

Signatures

	Name	Position	Unit	Date
1.	Elizabeth Marschall Digitally signed by Elizabeth Marschall DN: cn=Elizabeth Marschall, o=The Ohio State University, ou=Department of Evolution, Ecology and Organismal Biology, email=marschall.26@osu.edu, c=US Date: 2017.05.04 11:17:54 -04'00'	Chair	EEOB	5/4/2017
2.				
3.				

Revised 5/27/14

Course Number	*Course Title*	*Credit Hours*	*Role in Major*	*Program Learning Goals*
Biochem 4511	Introduction to Biological Chemistry	4	core	1*, 2*, 3*, 4*, 5*
MolGen 2220H	Intro to Molecular Life Sciences: Research Opportunities and Career Options	1	elective	1, 2
MolGen 3300	General Plant Biology	3	elective	1*, 2*
MolGen 3436	Introductory Plant Physiology	3	elective	1*, 2*
MolGen 4503	Molecular Genetics Writing Project	1	elective	6**, 7**, 8**
MolGen 4591S	DNA Fingerprinting Workshops in Columbus Public Schools	1	elective	6**, 7**
MolGen 4606	Molecular Genetics	4	core course	1*, 2*, 3*, 4*, 5*
MolGen 4700	Molecular Cell and Developmental Biology	3	elective	1*, 2*, 3*, 4*, 5*
MolGen 4703	Human Genetics	2	elective	2**, 3**, 4**, 8*
MolGen 4998	Undergraduate Research in Molecular Genetics	1 to 3	elective	3**, 4**, 5**, 6**, 7**, 8**
MolGen 4998H	Undergraduate Research in Molecular Genetics	1 to 3	elective	3**, 4**, 5**, 6**, 7**, 8**
MolGen 4999	Thesis Research in Molecular Genetics	1 to 3	elective	3**, 4**, 5**, 6**, 7**, 8**
MolGen 4999H	Thesis Research in Molecular Genetics	1 to 3	elective	3**, 4**, 5**, 6**, 7**, 8**
MolGen 5193	Individual Studies	1 to 3	elective	6**, 7**, 8**
MolGen 5194	Group Studies	1 to 3	elective	2**, 8**
MolGen 5300	Cancer Genetics	2	elective	2**, 3**, 4**, 8**
MolGen 5601	Eukaryotic Molecular Genetics Lab	3 or 4	core course	2*, 3*, 4*, 5*, 6*, 7*
MolGen 5602	Eukaryotic Cell and Developmental Laboratory	3 or 4	core course	2*, 3*, 4*, 5*, 6*, 7*
MolGen 5607	Cell Biology	3	core course	1*, 2*, 3*, 4*, 5*
MolGen 5607E	Cell Biology	4	core course	1*, 2*, 3*, 4*, 5*, 6*
MolGen 5608	Genes and Development	3	core course	1*, 2*, 3*, 4*, 5*
MolGen 5608E	Genes and Development	4	core course	1*, 2*, 3*, 4*, 5*, 6*
MolGen 5623	Genetics and Genomics	2	elective	2**, 3**, 4**, 8**
MolGen 5630	Plant Physiology	3	elective	2**, 3**, 4**, 8**
MolGen 5632	Insect Molecular Genetics	2	elective	2**, 3**, 4**, 8**
MolGen 5643	Plant Anatomy	3	elective	2**, 3**, 4**, 6**, 7*, 8**
MolGen 5645	Quantitative, Population, and Evolutionary Genetics	2	core course	1*, 2*, 3*, 4*, 5*
MolGen 5650	Analysis and Interpretation of Biological Data	3	elective	3**, 5**
MolGen 5695	Frontiers in in Life Sciences Research: Genomics, Proteomics and Bioethics	1	elective	2**, 3**, 4**, 8**
MolGen 5700	Systems of Genetic Analysis	3	elective	2**, 3**, 4**, 8**
MolGen 5701	DNA Transactions and Gene Regulation	4	elective	2**, 3**, 4**, 8**
MolGen 5705	Advances in Cell Biology	2	elective	2**, 3**, 4**, 8**
MolGen 5715	Developmental Genetics	2	elective	2**, 3**, 4**, 8**
MolGen 5733	Advanced Human Genetics	2	elective	2**, 3**, 4**, 8**
MolGen 5735	Plant Biochemistry	3	elective	2**, 3**, 4**, 8**
MolGen 5795	Special Topics in Molecular Genetics	1 to 3	elective	2**, 3**, 4**, 8**
MolGen 5796	Current Topics in Signal Transduction	1 to 2	elective	2**, 3**, 4**, 8**
MolGen 5797	Study at a Foreign Institution	1 to 3	elective	6*, 7*, 8*
MolGen 5798	Study Tour: Domestic	1 to 3	elective	6*, 7*, 8*
MolGen 5800	Organelle Biology	2	elective	2**, 3**, 4**, 8**

Major Learning Goals

1. Undergraduate Molecular Genetics majors acquire a basic mastery of fundamental concepts of biology, chemistry, mathematics, physics, and the scientific method.
2. Undergraduate Molecular Genetics majors acquire a basic mastery of fundamental areas of molecular genetics, including transmission genetics, the central dogma of molecular biology, regulation of gene expression, quantitative and population genetics, genomics, recombinant DNA and biotechnology, and cell and developmental biology.
3. Undergraduate Molecular Genetics majors develop analytical and problem solving skills in areas of genetics and molecular biology.
4. Undergraduate Molecular Genetics majors acquire a basic mastery of experimental techniques and approaches used in genetics and molecular biology.
5. Undergraduate Molecular Genetics majors acquire a basic mastery of data analysis and statistical approaches used in genetics and molecular biology.
6. Undergraduate Molecular Genetics majors effectively communicate their understanding of genetics and molecular biology both orally and in writing.
7. Undergraduate majors participate in academic research and/or outreach activities that are consistent with their interests and postgraduate plans.
8. Undergraduate majors acquire expertise relevant to their chosen are of specialization.

*Program learning goals with no asterisk = beginner's level; * = intermediate level; ** = advanced level*