

Term Information

Effective Term Spring 2016

General Information

Course Bulletin Listing/Subject Area Molecular Genetics
Fiscal Unit/Academic Org Molecular Genetics - D0340
College/Academic Group Arts and Sciences
Level/Career Graduate, Undergraduate
Course Number/Catalog 5300
Course Title Cancer Genetics
Transcript Abbreviation Cancer Genetics
Course Description During this course, students will learn about the genetic evolution of human cancer. Specifically, the hallmarks of cellular transformation and tumor progression will be discussed. Students will be introduced to modern approaches aimed at targeting genetic aberrations in cancer cells. Coursework will include hands-on training in the use of online databases of cancer genetics.
Semester Credit Hours/Units Fixed: 2

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 C- or better in MolGen 4606 OR MolGen 4500
Exclusions

Cross-Listings

Cross-Listings

Subject/CIP Code

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

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 fundamental concepts of cancer biology;
appreciate how genetic and epigenetic processes influence tumor development;
know modern approaches to study cancer genetics;
understand how genetics is influencing modern cancer therapy

Content Topic List

- What is cancer
Hallmarks of cancer
Angiogenesis and Invasion
Tumor suppressors
Oncogenes
Cancer susceptibility
Epigenetic and cancer
The cancer genome (GWAS, next generation sequencing)
Applic. of next gen. sequencing to cancer biology

Attachments

- MolGen5300 Course Request.pdf: Department Chair letter
(Other Supporting Documentation. Owner: Vaessin, Harald Emil Friedrich)
- MOLGEN 5300 Syllabus.docx: Syllabus
(Syllabus. Owner: Vaessin, Harald Emil Friedrich)
- MolGenCurriculumMap-2015.pdf: Curriculum map
(Other Supporting Documentation. Owner: Vaessin, Harald Emil Friedrich)

Comments

- Please attach updated curriculum map if course can count in major. *(by Vankeerbergen, Bernadette Chantal on 04/21/2015 08:02 AM)*

COURSE REQUEST
5300 - Status: PENDING

Last Updated: Fink, Steven Scott
04/30/2015

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Vaessin, Harald Emil Friedrich	04/17/2015 10:13 PM	Submitted for Approval
Approved	Vaessin, Harald Emil Friedrich	04/17/2015 10:14 PM	Unit Approval
Approved	Fink, Steven Scott	04/20/2015 09:14 AM	College Approval
Revision Requested	Vankeerbergen, Bernadette Chantal	04/21/2015 08:02 AM	ASCCAO Approval
Submitted	Vaessin, Harald Emil Friedrich	04/30/2015 04:36 PM	Submitted for Approval
Approved	Vaessin, Harald Emil Friedrich	04/30/2015 04:39 PM	Unit Approval
Approved	Fink, Steven Scott	04/30/2015 06:00 PM	College Approval
Pending Approval	Nolen, Dawn Vankeerbergen, Bernadette Chantal Hanlin, Deborah Kay Jenkins, Mary Ellen Bigler Hogle, Danielle Nicole	04/30/2015 06:00 PM	ASCCAO Approval



April 17, 2015

Curriculum Review Committee:

We are seeking your approval for MolGen 5300 Cancer Genetics. This class is primarily targeted for upper level undergraduates and secondarily for junior graduate students. The course will have significant appeal to Molecular Genetics majors, where it will serve as a potential upper level elective, as well as other life science majors. No other similar course is offered that is targeted for this population of undergraduates. A version of this course has been offered this spring semester as MolGen 5194 Group Studies with cancer genetics as the topic. The course filled quickly with an enrollment of over 40 students. By all accounts the course has been well received and we look forward to offering it in future years under the MolGen Cancer Genetics course name.

Sincerely,

Mark A. Seeger, PhD
Chair, Department of Molecular Genetics
The Ohio State University

MOLGEN 5300
CANCER GENETICS
Monday & Wednesday 3:00-3:55

COURSE DIRECTORS:

Christin E. Burd, Assistant Professor
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Molecular and Cellular Biochemistry
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OFFICE HOURS:

Available by appointment. To set up a meeting, please email your instructor(s) using your name.# account.

COURSE MATERIALS:

1. The Biology of Cancer, 2nd edition. Robert Weinberg. Available on Amazon and slideshare: <http://www.slideshare.net/mamkiss/the-biology-of-cancer-2nd-edition>
2. Selected open source reading and A/V materials will be provided by the course directors on Carmen.
3. Although not required, students are encouraged to bring personal laptops for in-class projects.

COURSE DESCRIPTION:

During this course, students will learn about the genetic evolution of human cancer. Specifically, the hallmarks of cellular transformation and tumor progression will be discussed. Students will be introduced to modern approaches aimed at targeting genetic aberrations in cancer cells. Coursework will include hands-on training in the use of online databases of cancer genetics.

LEARNING OBJECTIVES:

- 1. Introduce fundamental concepts of cancer biology**
The basic tenets of cancer initiation and progression will be reviewed. Students will learn the hallmarks of cancer, as defined by Weinberg and Hanahan, and apply this background knowledge to genetic mechanisms discussed throughout the course.
- 2. Study how genetic and epigenetic processes influence tumor development and progression**
The mechanisms by which genetic and epigenetic alterations occur in cancer will be described in detail. In addition, the consequences of these events on cancer initiation and progression will be discussed.
- 3. Learn modern approaches to study cancer genetics**
Students will learn how to access and harness information from cancer databases such as OncoPrint and The Cancer Genome Atlas (TCGA). Methods of high-throughput genomic and epigenomic analysis will be described.
- 4. Discover how genetics is influencing modern cancer therapy**
Students will learn about the idea of personalized cancer therapy. Successes and failures of drugs which target the genetic alterations unique to a patient's tumor will be discussed.

COURSE SCHEDULE:

Date	Topic	Lecturer	Lecture #
Week 1	Introduction <ul style="list-style-type: none"> Review of course syllabus, grading and expectations What is cancer? 	Christin Burd	1
Week 1	Hallmarks of cancer <ul style="list-style-type: none"> Part 1 – Proliferation and Resistance to Death 	Christin Burd	2
Week 2	Hallmarks of cancer <ul style="list-style-type: none"> Part 2 – Angiogenesis and Invasion 	Christin Burd	3
Week 2	Hallmarks of cancer <ul style="list-style-type: none"> Part 2/3 – The immune system 	Christin Burd	4
Week 3	Tumor suppressors	Craig Burd	5
Week 3	Oncogenes	Craig Burd	6
Week 4	DNA Damage and Repair	Christin Burd	7
Week 4	In class written exam – lectures 1-7		
Week 5	The genetics of cancer susceptibility <ul style="list-style-type: none"> Heritable vs. Somatic mutation Cancer risk polymorphisms 	Craig Burd	8
Week 5	The genetics of cancer susceptibility <ul style="list-style-type: none"> Cancer predisposing mutations Genetic testing 	Craig Burd	9
Week 6	Epigenetics <ul style="list-style-type: none"> Chromatin Biology 	Craig Burd	10
Week 6	Epigenetics <ul style="list-style-type: none"> DNA methylation in cancer 	Craig Burd	11
Week 7	Epigenetics <ul style="list-style-type: none"> Histone modifications in cancer 	Craig Burd	12
Week 7	Genetic Diversity within a tumor	Christin Burd	13
Week 8	The cancer genome <ul style="list-style-type: none"> Next generation sequencing technologies 	Craig Burd	14
Week 8	The cancer genome <ul style="list-style-type: none"> Applying next generation sequencing to cancer biology 	Craig Burd	15
Week 9	In class written exam – Lectures 8-15		
Week 9	The cancer genome <ul style="list-style-type: none"> GWAS 	Craig Burd	16
Week 10	Using cancer genetics databases <ul style="list-style-type: none"> Introduction to ONCOMINE and COSMIC 	Craig Burd	17
Week 10	Using cancer genetics databases <ul style="list-style-type: none"> Introduction to TCGA 	Craig Burd	18
Week 11	In class group project: Using cancer genetic databases		

Week 11	Genetically Engineered Mouse Models (GEMMs) of Human Cancer • Transgenic and knock-in mouse models (Part 1)	Christin Burd	
Week 12	Genetically Engineered Mouse Models (GEMMs) of Human Cancer • Transgenic and knock-in mouse models (Part2)	Christin Burd	19
Week 12	Cancer Therapy • Non-targeted approaches to cancer therapy	Christin Burd	20
Week 13	In class group presentations: Using cancer genetic databases		21
Week 13	Cancer Therapy • Targeted approaches to cancer therapy	Christin Burd	22
Week 14	From Genetics to Targeted Therapies (part 1) • Development of vemurafenib	Christin Burd	23
Week 14	From Genetics to Targeted Therapies (part 2) • Resistance to vemurafenib	Christin Burd	24
Finals Week	Final Exam - Lectures 16-24		

GRADING POLICY:

The course is graded on an A-E basis. Four components will be used to determine a final grade:

Lecture Surveys	05%
In-class written exam #1	25%
In-class written exam #2	25%
In-class group presentation	15%
Final exam	<u>30%</u>
Total: 100%	

GRADING SCALE:

A	93-100%	C+	77-79.9%	E	<65%
A-	90-92.9%	C	73-76.9%		
B+	87-89.9%	C-	70-72.9%		
B	83-86.9%	D	65-69.9%		
B-	80-82.9%				

COURSE ATTENDANCE POLICY:

In order to be successful in this course, attendance is expected for all lectures and mandatory for all in-class exams and projects.

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/>.

STATEMENT ON DISABILITY SERVICES:

Students with disabilities that have been certified by the Office for 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 150 Pomerene Hall, 1760 Neil Avenue; Telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.

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 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	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

- Undergraduate Molecular Genetics majors acquire a basic mastery of fundamental concepts of biology, chemistry, mathematics, physics, and the scientific method.
- 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.
- Undergraduate Molecular Genetics majors develop analytical and problem solving skills in areas of genetics and molecular biology.
- Undergraduate Molecular Genetics majors acquire a basic mastery of experimental techniques and approaches used in genetics and molecular biology.
- Undergraduate Molecular Genetics majors acquire a basic mastery of data analysis and statistical approaches used in genetics and molecular biology.
- Undergraduate Molecular Genetics majors effectively communicate their understanding of genetics and molecular biology both orally and in writing.
- Undergraduate majors participate in academic research and/or outreach activities that are consistent with their interests and postgraduate plans.
- Undergraduate majors acquire expertise relevant to their chosen area of specialization.

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