INSTRUCTOR: Dr. Xiaoqi Liu  
office: Hansen 233C  
TEL: 496-3764  
e-mail: liu8@purdue.edu  
Office hours: Immediately following class or by appointment

LECTURE TA: Yueping Zhang  
office: BCHM B10  
TEL: 494-3722  
e-mail: zhang446@purdue.edu  
Office hours: Tuesday and Thursday 1-3PM. Please see the TA if you need assistance with assignments or have questions about your grades.

COURSE OBJECTIVES  
This is a 3-credit course designed for 1st or 2nd year graduate students. With a specific focus on newly emerging topics, the molecular basis for the major intracellular signaling pathways of eukaryotes will be covered. This course will be taught from current primary literature, using a textbook as a background resource. The following topics will be included: protein kinases and phosphatases, G protein coupled receptors, receptor tyrosine kinases, PI3K pathway, mTOR pathway, PTEN, Wnt/β-catenin pathway, the Notch pathway, the Hedgehog/Gli pathway, cell cycle control, the p53 pathway, DNA damage checkpoint, regulated proteolysis, programmed cell death and cancer metabolism. Students will learn how to read and interpret scientific literature through class presentations, discussions and take home assignments. Additionally, students will gain experience in developing and testing hypotheses within the class topic areas.

LEARNING OUTCOMES  
Basic knowledge of the molecular mechanisms in signal transduction and cell cycle  
An appreciation for how protein modules within signaling molecules impart selective responses, how protein-protein interactions are used to build signaling pathways, and the methods commonly used to analyze signal transduction processes.  
An appreciation for cell cycle is carefully regulated to maintain genomic stability.  
Enhancement of oral and written communication skills  
Mastery of reading and interpreting scientific literature in signal transduction and cell cycle fields  
Development of critical thinking and creativity in signal transduction and cell cycle research
TEXTBOOK

Textbook
Molecular Biology of the Cell, 4th edition
Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter.

The textbook is suggested for this course. This textbook is free on line at http://www.ncbi.nlm.nih.gov/books/NBK21054/. Type the topic of interest, and you can read the basic knowledge about that particular topic. It contains necessary background information for reading and interpreting primary literature. Students should read the appropriate chapters in this book prior to reading assigned papers.

A significant portion of the material from this course will be covered by reviews from the scientific literature. These are accessible free of charge and electronically through the Purdue Library. Links to these sources and the PDF files can be downloaded from Blackboard.

LECTURE TIME AND PLACE

Tuesdays and Thursdays 9:00-10:15 am
Lilly Room G401

All lectures will be recorded, and will be available for students who miss a class or who would like to review a lecture. They can be downloaded at http://www.itap.purdue.edu/learning/tools/boilercast/

BLACKBOARD

The syllabus for the course, lecture notes, and grading keys for quizzes and exams will be available via the Purdue University Blackboard site at:
http://www.itap.purdue.edu/learning/tools/blackboard/

ASSESSMENT

The class assessment will be composed of three parts: Homework, class participation and a grant proposal. We will discuss 13 selected papers in class. Students are expected to write their review comments on the paper discussed as their homework, students will be asked to present all 13 papers in class, and write and defend a grant proposal.

The grading for this course will be as follows:

Homework 130 points
Class participation 30 points
Grant proposal 40 points
The cutoff values for letter grades are as follows:

- 180 points: A
- 160 points: B
- 140 points: C
- 120 points: D
- 119 points and below: F

Missing a presentation will result in a grade of 0 being recorded unless documented justification for the absence is presented. Any request to be excused from a presentation must include official documentation (doctor’s note, request from academic advisor, etc) explaining why the exam was or will be missed. Makeup tests will be scheduled in consultation with the instructor.

If you have any disagreements with the way any of your homework or presentations have been graded, please consult the grading key and then discuss them with the lecture TA. In the event this does not resolve your concerns, please take them up with the instructor.

Requests for re-grades must be submitted no later than the end of the immediate following week after the graded assignment has been returned.

**EXTRA CREDIT**

There will be opportunity for extra credit by attending some course topic-related seminars.

**OBTAINING EXTRA HELP**

Dr. Liu will be available to answer your questions immediately after class, during office hours, or by appointment (arranged in class or by e-mail). Alternatively, you can submit questions by e-mail that can be answered in class or by return e-mail.

The lecture TA will hold office hours for at least 3 hours per week, and will be able to answer additional questions by appointment.

**ACADEMIC MISCONDUCT**

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue’s policies with regard to academic misconduct can be found at [http://www.purdue.edu/studentregulations/student_conduct/regulations.html](http://www.purdue.edu/studentregulations/student_conduct/regulations.html)

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course
Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

"Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
• presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
• submitting a document written by someone else but representing it as one's own”

CLASS ATTENDANCE

In accordance with University policy, you are expected to attend every scheduled class. If you have a valid reason for missing class such as a University-sponsored activity, religious observances, illness, or family emergency, the instructor or TA will assist you in obtaining information and materials you may have missed. Students who skip class without a valid excuse should not expect the instructor or TA to supply class notes or provide special help. For the official university policy, see: www.purdue.edu/odos/services/classabsence.php and http://www.purdue.edu/studentregulations/regulations_procedures/classes.html

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course consult the class Blackboard site or e-mail or phone the instructor.

ON-LINE COURSE EVALUATIONS

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. On Monday of the fifteenth week of classes, you will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

NON-DISCRIMINATION POLICY STATEMENT

Purdue University's non-discrimination policy will be upheld in this classroom. Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

In this course, each voice in the classroom has something of value to contribute. Please take care to respect the different experiences, beliefs and values expressed by students and staff involved in this course. We support Purdue's commitment to diversity, and welcome individuals of all ages, backgrounds, citizenships, disability, sex, education, ethnicities, family statuses, genders, gender identities, geographical locations,
languages, military experience, political views, races, religions, sexual orientations, socioeconomic statuses, and work experiences

For more information, see http://www.purdue.edu/purdue/ea_eou_statement.html.
# LECTURE SCHEDULE

## Week 1

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<th>Topic</th>
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<tr>
<td>8/28</td>
<td>Th</td>
<td>Literature Discussion 1</td>
<td>Research papers:</td>
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<td>Huang S et al MED12 controls the response to multiple cancer drugs through regulation of TGF-β receptor signaling. <em>Cell</em> 2012, 151, 937-950.</td>
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## Week 2

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<td>9/4</td>
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<td>Literature Discussion 2</td>
<td>Research papers:</td>
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## Week 3

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<td>9/9 3:30PM BCHM seminar by Dr. Wenyi Wei, Harvard Medical School, WSLR 116</td>
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<td>6 9/11 Th Literature Discussion 3</td>
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## Week 4

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<td>9/18</td>
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<td>Literature Discussion 4</td>
<td>Research papers:</td>
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## Week 5

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<tr>
<td>9/23</td>
<td>Tu</td>
<td>Lecture 5</td>
<td>The Wnt and Notch pathways</td>
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10 9/25  Th  Literature Discussion 5  
Research papers:  

Week 6
11 9/30  Tu  Lecture 6  
Mammalian cell cycle
Review: Jia L et al., Tracking spindle checkpoint signals from kinetochores to APC/C. *Trends Biochem Sci*. 2013, 38, 302-11

12 10/2  Th  Literature Discussion 6  
Research papers:  
Heller RC et al., Eukaryotic Origin-Dependent DNA Replication In Vitro Reveals Sequential Action of DDK and S-CDK Kinases, *Cell* 2011, 146, 80-91.  

Week 7
10/6 3:30PM  PULSE seminar by Dr. Yong Wan, University of Pittsburgh,

13 10/7  Lecture 7  
The p53 pathway
Review:  

14 10/9  Literature Discussion 7  
Research papers:  

Week 8
10/14 No class, Fall break
15 10/16  Th  Lecture 8 (Dr. Sandy Rossie)  Phosphatases

Week 9
16 10/21  Tu  Lecture 9  
DNA damage checkpoint

17 10/23  Th  Literature Discussion 8
Research papers:


**Week 10**
18 10/28 Tu Lecture 10 Regulated proteolysis and Hallmarks of cancer

Review:

19 10/30 Th Literature discussion 9

Research papers:
Gao D et al. mTOR Drives Its Own Activation via SCFβTrCP-Dependent Degradation of the mTOR Inhibitor DEPTOR *Mol Cell*, 2011, 44, 290-303.

**Week 11**
20 11/4 Tu Lecture 11 Programmed cell death

Review:

21 11/6 Th Literature Discussion 10

Research papers:

**Week 12**
22 11/11 Tu Lecture 12 (Dr. Mark Hall) Cell cycle in yeast
23 11/13 Th Literature Discussion 11

Research papers:

**Week 13**
24 11/18 Tu Lecture 13 (Dr. Jer-Yen Yang) The Hedgehog/Gli pathway

25 11/20 Th Literature Discussion 12

Research papers:

**Week 14**
26 11/25 Tu Lecture 14 (Dr. Vikki Weake) Transcription coactivators in signaling pathways
11/27 Th No class, Happy Thanksgiving!

**Week 15**
27 12/2 Tu Lecture 15 Cancer metabolism


28 12/4 Th Literature Discussion 13

Research papers:
Ying H et al Oncogenic Kras Maintains Pancreatic Tumors through Regulation of Anabolic Glucose Metabolism *Cell* 2012, 149, 656-670.

12/4 11:30AM PCCR seminar by Dr. Andrew Thorburn, University of Colorado, DDRF.

**Week 16**
29 12/9 Tu Final grant proposal defense I
30 12/11 Th Final grant proposal defense II