New Course Request

Indiana University
Indianapolis Campus

Check Appropriate Boxes:
Undergraduate credit [ ] Graduate credit [X] Professional credit [ ]

1. School/Division: Medicine/Graduate
2. Academic Subject Code: GRAD

3. Course Number: 6726 (must be cleared with University Enrollment Services)
4. Instructor: Xin Zhang, PhD

5. Course Title: Developmental Genetics
   Recommended Abbreviation (Optional) _______________________
   (Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year): Spring 2008
7. Credit Hours: Fixed at 1 or Variable from ___ to ___
8. Is this course to be graded S-F (only)? Yes ___ No [X]
9. Is variable title approval being requested? Yes ___ No [X]

10. Course description (not to exceed 50 words) for Bulletin publication:
    This introductory course focuses on the genetic basis of mouse development. It covers the principles of embryogenesis and explores the mechanism of morphogenic signaling and transcriptional control of body plan and tissue differentiation. Special emphasis will be placed on the role of developmental genetics in understanding human disease.

11. Lecture Contact Hours: Fixed at 15 or Variable from ___ to ___
12. Non-Lecture Contact Hours: Fixed at 0 or Variable from ___ to ___
13. Estimated enrollment: 5 of which 100 percent are expected to be graduate students.
14. Frequency of scheduling: Annually
   Will this course be required for majors? No
15. Justification for new course: Elective module in new open admission PhD curriculum
16. Are the necessary reading materials currently available in the appropriate library? Yes
17. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other materials.
18. If this course overlaps with existing courses, please explain with which courses it overlaps and whether this overlap is necessary, desirable, or unimportant.
19. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus consulted.

Submitted by: ___________________________
Date [ ]/14/10
Department Chairman/Division Director

Approved by: ___________________________
Date [ ]/18/07
Dean

Dean of Graduate School (when required)

University Enrollment Services

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.

UPS 724 University Enrollment Services Final—White; Chancellor/Vice-President—Blue; School/Division—Yellow; Department/Division—Pink; University Enrollment Services Advance—White
I. **Title:** Developmental Genetics  
   Course number: G726  
   Instructors: Xin Zhang (course director), Simon Conway, Weinian Shou, Simon Rhodes and Tony Firulli.  
   Prerequisites: none

II. **COURSE DESCRIPTION AND RATIONALE**  
This introductory course focuses on the genetic basis of mouse development. It covers the principles of organogenesis and regeneration. Using model systems including Left/right asymmetry, sex determination and development of eye, heart and pituitary, this course will explore the mechanism of morphogenic signaling and transcriptional control of body plan and tissue differentiation. Special emphasis will be placed on the role of developmental genetics in our understanding human disease.

50 word for the course request cover sheet and the bulletin.

This introductory course focuses on the genetic basis of mouse development. It covers the principles of embryogenesis and explores the mechanism of morphogenic signaling and transcriptional control of body plan and tissue differentiation. Special emphasis will be placed on the role of developmental genetics in our understanding human disease.

III. **EDUCATIONAL OBJECTIVES**
- Basic mouse genetics techniques
- Vertebrate body plan, sex determination
- Induction, lineage allocation, morphogenetic movement, cell commitment
- Control of gene expression by homeodomain and bHLH transcription factors
- Molecular mechanisms of peptide growth factors and hormonal regulators
- Development of heart, eye and pituitary organ

IV. **COURSE CONTENT:**

**Lecture 1: Principles of Developmental Biology and Transgenics**
1. Beginnings, present and future impacts on society  
2. Regional specification, cell differentiation, morphogenesis & growth  
3. Genes & control of gene expression  
4. Mouse as a model organism  
   - Genetics and genome maps  
   - Access, availability & manipulation  
   - Genetics and genome maps  
5. Limitations & relevance

**Lecture 2: Organogenesis & Regeneration from the Heart’s Perspective**
1. Cardiac lineage allocation, morphogenetic movement, cell commitment  
2. Heart induction, differentiation  
3. Transcriptional control and patterning of vertebrate heart  
4. Extra-cardiac colonization of the heart
5. Normal and abnormal heart development

Lecture 3: Morphogens and peptide growth factors
1. Historical landmarks of the discovery of morphogens.
2. Role of morphogen gradient.
3. The nature of morphogens.
5. Fibroblast growth factors and their intracellular signaling pathway.
6. Regulation of expression pattern of growth factors in developmental system.
7. Cross talk between growth factors (intracellular and extracellular mechanisms).

Lecture 4: Hormonal regulation in Development
1. General concept of Sex determination and differentiation.
2. Chromosomal sex determination
3. Secondary sex determination

Lecture 5: Developmental Regulators
1. Hox code and body plan
2. Homeodomain transcription factors and organ formation

Lecture 6: Organogenesis (II): Development of eye
1. Fly eye development: Morphogenetic furrow, R1-R8
2. Mouse Lens development
3. Mouse Retinal development

Lecture 7: Cell differentiation and Muscle development
1. Overview
2. Somites
3. Cell specification and differentiation
4. Myogenic bHLH factors
5. Mef2
6. HATs and Hdcas
7. Putting it together MEF2 interaction with Hdac4&5 example of developmental regulation via chromatin coordination with tissue specific factors.

Lecture 8: The Twist family of bHLH transcription factors: tissue specific functions in diverse tissue types and functional implications in human disease
1. Introduction of Twist and Hand factors
2. Conservation of family
3. Expression patterns in various species
4. Phenotypes in various models of gene ablation
5. Functional specifics of twist-class proteins
6. Helix I phosphorylation
7. Saethre-Chotzen syndrome
Lecture 9 – The anterior pituitary as a model for the development of an organ with multiple specialized cell types
1. Introduction
2. Inductive signals drive the development of early structures
3. Early transcriptional events
4. Mid-phase transcriptional events
5. Late transcriptional events
6. Basic science translated to the clinic; then using clinical observations to develop new basic science hypotheses

EXAM

V. REQUIRED AND RECOMMENDED TEXTS:

VI. EVALUATION AND GRADING:
Student grades in the course will be determined by one examination, which will be short essay questions. Objectives covered in the lectures will be the source of all examination questions.

Grading Scale:

<table>
<thead>
<tr>
<th>Letter grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92.99</td>
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<tr>
<td>B+</td>
<td>87-89.99</td>
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<tr>
<td>B</td>
<td>75-86.99</td>
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<tr>
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<tr>
<td>D</td>
<td>50-59.99</td>
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<tr>
<td>F</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>

Note that grades of C and lower are not passing grades in graduate level courses.

VII. BIBLIOGRAPHY:

Representative sample of the selected readings related to the course:
5. Kmita M, Duboule D. Organizing axes in time and space; 25 years of colinear tinkering. 

VIII. CHEATING AND PLAGIARISM:

Students are instructed to make themselves aware of University regulations concerning plagiarism, the maintenance of academic honesty and the definitions of unacceptable behavior and cheating. Academic misconduct of any sort will not be tolerated and will be dealt with as outlined in the IU/IUPUI Code of Student Rights, Responsibilities, and Conduct, which can be viewed at:
http://www.life.iupui.edu/help/docs/Part_3all.html

Examples of misconduct include but are not limited to:
1. Cheating
   A student must not use or attempt to use unauthorized assistance, materials, information, or study aids in any academic exercise
2. Fabrication
   A student must not falsify or invent any information or data in an academic exercise including, but not limited to, records or reports, laboratory results, and citations to the sources of information.
3. Plagiarism
   A student must not adopt or reproduce ideas, words, or statements of another person without appropriate acknowledgment. A student must give credit to the originality of others and acknowledge an indebtedness whenever he or she does any of the following:
   a. Quotes another person's actual words, either oral or written
   b. Paraphrases another person's words, either oral or written
   c. Uses another person's idea, opinion, or theory; or
   d. Borrows facts, statistics, or other illustrative material, unless the information is common knowledge.
4. Interference
   a. A student must not steal, change, destroy, or impede another student's work.
   b. A student must not give or offer a bribe, promise favors, or make threats with the intention of affecting a grade or the evaluation of academic performance.

Potential consequences for academic misconduct:
If the instructor has information that one of his/her students committed an act of academic misconduct, the faculty member will hold an informal conference with the student. The conference will be prompt and private. If the faculty member concludes that the student is responsible for the misconduct, then the faculty member will impose an appropriate academic sanction (i.e., lower or failing grade on the assignment, assessing a lower or failing grade for the course).
IX. AMERICANS WITH DISABILITIES ACT:
If you need any special accommodations due to a disability, please contact Adaptive Educational Services at (317)-274-3241. The office is located in CA 001E.
Letter from Dr. N. Douglas Lees (Chair of Biology, IUPUI)

From: Lees, Norman D
Sent: Friday, May 04, 2007 12:30 PM
To: Rhodes, Simon J
Subject: Re: biomedical science courses

Simon,

I see no conflicts among the new and revised courses you have listed and existing courses in Biology.

Doug

Dear Doug and Frank,

Please find attached a Word file that outlines some proposed graduate level courses in biomedical sciences. Please note that some are not new course requests but will be requests to change existing courses (or courses not often taught but that have approved numbers) - I have included both types and noted the situation in the file. These are short, modular (mostly 1 credit, some 2 credit) courses that will be part of a first year, spring semester modular series that incoming IUSM PhD students will chose from as we switch to a common entry system for our PhD programs. I expect that the enrollment will be varied depending on the area - some will be very small and taught in a more informal tutorial style. In addition to our PhD students, there will perhaps be a few prospective students that might be "sampling" the curriculum. All of the classes will be open to any IUPUI graduate student with the appropriate prereqs that wants to take them. I do not think that the courses conflict with your course offerings.

I would like to submit course requests to the IUPUI graduate committee (GAC) as soon as possible. This committee typically wants to know that proposed new courses will not conflict with existing campus course offerings. I am therefore writing to ask if you would review the course outlines and please let me know if you agree.

A reply by e-mail would be fine.
Please let me know if you have any questions.
There will be a few more but this is the bulk of it. I will send the others to you soon.
Thanks very much,

Simon

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Simon J. Rhodes, Ph.D.
Associate Dean for Graduate Studies
Indiana University School of Medicine
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Attachment converted: Macintosh HD:SPRING COURSE drafts.doc (WDBN/«IC») (0042A42E)
Letter from Dr. Franklin Schultz (Chair of Chemistry and Chemical Biology, IUPUI)

From: schultz@chem.iupui.edu
Sent: Monday, May 07, 2007 3:21 PM
To: Rhodes, Simon J
Subject: Re: biomedical science courses

Simon
There are no conflicts with existing courses in the Department of Chemistry and Chemical Biology.
With best regards,

Franklin A. Schultz
Professor and Chair
Department of Chemistry and Chemical Biology
Indiana University Purdue University Indianapolis
402 North Blackford Street, LD 326
Indianapolis, IN 46202
Phone: 317-274-6875; Fax: 317-274-4701
chair@chem.iupui.edu

On Wednesday, May 2, 2007, at 07:37 PM, Rhodes, Simon J wrote:

Dear Doug and Frank,

Please find attached a Word file that outlines some proposed graduate level courses in biomedical sciences. Please note that some are not new course requests but will be requests to change existing courses (or courses not often taught but that have approved numbers) - I have included both types and noted the situation in the file. These are short, modular (mostly 1 credit, some 2 credit) courses that will be part of a first year, spring semester modular series that incoming IUSM PhD students will chose from as we switch to a common entry system for our PhD programs.. I expect that the enrollment will be varied depending on the area – some will be very small and taught in a more informal tutorial style. In addition to our PhD students, there will perhaps be a few prospective students that might be "sampling" the curriculum. All of the classes will be open to any IUPUI graduate student with the appropriate prereqs that wants to take them. I do not think that the courses conflict with your course offerings.
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A reply by e-mail would be fine.
Please let me know if you have any questions.
There will be a few more but this is the bulk of it. I will send the others to you soon.
Thanks very much,

Simon
Simon J. Rhodes, Ph.D.
Associate Dean for Graduate Studies
Indiana University School of Medicine