UNIVERSITY OF KENTUCKY

College of Medicine

Department of Physiology
MS508, Medical Center
800 Rose Street
Lexington, KY 40536-0298

August 9, 2011

To Whom It May Concern:

This is a proposal for a new undergraduate course entitled, PGY 417 Genomics and Epigenetics. PGY417 is an advanced course designed for students who desire to become research scientists in any area that makes use of cell/molecular biology and physiology. It teaches the study of cell and tissue function by global analysis of gene expression and gene regulation. By incorporating both lecture and computer lab exercises, it emphasizes both the technical aspects of measuring gene expression and gene regulation and the conceptual basis for these global analyses. It also teaches experimental design and other statistical concepts necessary to perform genomic and epigenetic experiments.

The course will be taught each spring semester in coordination with an existing graduate course, PGY/PHA 617 Physiological Genomics.

Coordination of PGY 417 Genomics and Epigenetics with PGY/PHA 617 Physiological Genomics.

History. We have been teaching PGY/PHA 617 since 2004. The students enrolled have been largely graduate students along with a smaller number of postbaccalaureate students. The success of the latter has convinced the instructors that upper level undergraduates are able to handle the same material and would benefit from it. However, no undergraduates have yet registered for the course. To make this subject more visible and accessible to undergraduate students, we therefore propose an undergraduate course. We have made contact with the Honors Program (Dr. Frank R. Ettensohn), and if the expected changes in the program come to fruition, we plan to apply for an honors designation for PGY417.

Plan. We will teach all students in both classes together in the same room and cover the same material. Enrollment in PGY/PHA 617 has ranged from 4 – 18 students. We have the capacity to teach at least 35 students (the computer labs we use for the course hold 35 – 55 students), so we project that a cap of 15 undergraduates in PGY417 will be reasonable.

Course distinctions. PGY417 students will be treated differently than PGY/PHA 617 students in three ways. First, the final project in PGY417 will not require a statement of biological interpretation of the complex data set that is assigned, but rather only completion of the data analysis. Undergraduates typically lack the breadth and depth of biological knowledge necessary to make a sophisticated interpretation of the results. Second, full credit will be given for the experimental design assignment if one is submitted, irrespective of its quality. Third, RNA

isolation for the RNA quality test lab will not be required because it necessitates access to organisms or cultured cells in a wet lab outside normal class hours; easy for life science graduate students but difficult for most undergraduates. Performance assessment in PGY417 will therefore be based solely on their ability to learn the material and procedures contained within the course material. In contrast, performance assessment in PGY617 involves tasks (RNA isolation), relatively deep understanding a specific biological problem (experimental design) and making interpretations (final project) that require incorporating knowledge and experience not specifically taught in the course.

Sincerely,

Timothy S. McClintock, Ph. D.
Louis Boyarsky Professor of Physiology
Department of Physiology

NEW COURSE FORM

1. General Information.

a. Submitted by the College of: Medicine | Today's Date: 7/21/11

b. Department/Division: Physiology

c. Contact person name: McClintock, Tim | Email: mcclint@uky.edu | Phone: 3-1083

d. Requested Effective Date: ☐ Semester following approval | OR | ☒ Specific Term/Year[1]: Spring 2013

2. Designation and Description of Proposed Course.

a. Prefix and Number: PGY 417

b. Full Title: Genomics and Epigenetics

c. Transcript Title (if full title is more than 40 characters): _____

d. To be Cross-Listed[2] with (Prefix and Number): _____

e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours[3] for each meeting pattern type.

1 Lecture	2 Laboratory[1]	_____ Recitation	_____ Discussion	_____ Indep. Study
_____ Clinical	_____ Colloquium	_____ Practicum	_____ Research	_____ Residency
_____ Seminar	_____ Studio	_____ Other – Please explain:	_____	

f. Identify a grading system: ☒ Letter (A, B, C, etc.) ☐ Pass/Fail

g. Number of credits: 2

h. Is this course repeatable for additional credit? YES ☐ NO ☒

If YES: Maximum number of credit hours: _____

If YES: Will this course allow multiple registrations during the same semester? YES ☐ NO ☐

i. Course Description for Bulletin: This advanced course is designed for students who desire to become research scientists in any area that makes use of molecular biology, molecular physiology, or molecular systems biology. It teaches the study of cell and tissue function by global analysis of gene expression and gene regulation. By incorporating both lecture and computer lab exercises, it emphasizes both the technical aspects of measuring gene expression and gene regulation and the conceptual basis for these global analyses. It also teaches experimental design and other statistical concepts necessary to perform genomic and epigenetic experiments.

j. Prerequisites, if any: At least one course in Cell Biology or Molecular Biology

k. Will this course also be offered through Distance Learning? YES[4] ☐ NO ☒

l. Supplementary teaching component, if any: ☐ Community-Based Experience ☐ Service Learning ☐ Both

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[1] Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

[2] The chair of the cross-listing department must sign off on the Signature Routing Log.

[3] In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, represents at least two hours per week for a semester for one credit hour. (from *SR 5.2.1*)

[4] You must *also* submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.

NEW COURSE FORM

3.	**Will this course be taught off campus?**	YES ☐	NO ☒
4.	**Frequency of Course Offering.**		
a.	Course will be offered (check all that apply): ☐ Fall ☒ Spring ☐ Summer		
b.	Will the course be offered every year?	YES ☒	NO ☐
	If NO, explain: _____		
5.	**Are facilities and personnel necessary for the proposed new course available?**	YES ☒	NO ☐
	If NO, explain: _____		
6.	**What enrollment (per section per semester) may reasonably be expected?** 10		
7.	**Anticipated Student Demand.**		
a.	Will this course serve students primarily within the degree program?	YES ☐	NO ☒
b.	Will it be of interest to a significant number of students outside the degree pgm?	YES ☒	NO ☐
	If YES, explain: Physiology does not offer an undergraduate degree. All undergraduates will therefore be pursuing degrees from other programs.		
8.	**Check the category most applicable to this course:**		
	☐ Traditional – Offered in Corresponding Departments at Universities Elsewhere		
	☐ Relatively New – Now Being Widely Established		
	☒ Not Yet Found in Many (or Any) Other Universities		
9.	**Course Relationship to Program(s).**		
a.	Is this course part of a proposed new program?	YES ☐	NO ☒
	If YES, name the proposed new program: _____		
b.	Will this course be a new requirement[5] for ANY program?	YES ☐	NO ☒
	If YES[5], list affected programs: _____		
10.	**Information to be Placed on Syllabus.**		
a.	Is the course 400G or 500?	YES ☐	NO ☒
	If YES, the *differentiation for undergraduate and graduate students must be included* in the information required in ***10.b***. You must include: (i) identification of additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4.*)		
b.	☒ The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from ***10.a*** above) are attached.		

[5] In order to change a program, a program change form must also be submitted.

NEW COURSE FORM

Signature Routing Log

General Information:

Course Prefix and Number: PGY 417

Proposal Contact Person Name: McClintock, Tim Phone: 3-1083 Email: mcclint@uky.edu

INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
Curriculum Committee	9/19/11	Darrell Jennings, MD / 75286 / brandi.tauffener@uky.edu	
Faculty Council	11/15/11	Brian Jackson, PhD / 74905 / Jackson@email.uky.edu	
UKCOM Dean		Frederick deBeer, M.D. / 135079 / fcmcc12@email.uky.edu	
HCCC		/ /	
		/ /	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision[6]
Undergraduate Council	4/10/2012	Sharon Gill	
Graduate Council			
Health Care Colleges Council	1/17/12	Heidi Anderson	
Senate Council Approval		University Senate Approval	

Comments:

[6] Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

SYLLABUS

PGY 417 Genomics and Epigenetics **Credit hours: 2**

Tuesday, Thursday 3:00 – 5:00 pm CN602J computer lab

Co-course directors:

Tim McClintock, Physiology, MS585 Med Sci., 323-1083, mcclint@uky.edu
Kuey-Chu Chen, Molecular and Biomedical Pharmacology, 323-6241, kueyc@uky.edu

Instructors:

E. Penni Black, Pharmaceutical Sciences, 323-5898, Penni.Black@uky.edu
Eric Blalock, Molecular and Biomedical Pharmacology, 323-8033, emblal@uky.edu
Arnold Stromberg, Statistics, 257-6903, stromberg@uky.edu

Office hours: By appointment. Students are encouraged to consult with participating faculty as needed.

Course Description. This advanced course is designed for students who desire to become research scientists in any area that makes use of cell/molecular biology and physiology. It teaches the study of cell and tissue function by global analysis of gene expression and gene regulation. By incorporating both lecture and computer lab exercises, it emphasizes the technical aspects of measuring gene expression and gene regulation along with the conceptual bases for these global analyses. It also teaches experimental design and other statistical concepts necessary to perform genomic and epigenetic experiments.

Student Learning Outcomes Students will learn to:

1. Extract detailed information about a gene and its encoded protein from databases.
2. Design an expression profiling or epigenetics experiment and choose the appropriate method.
3. Analyze results, including the identification of functional processes and pathways in the data.
4. Construct hypotheses and tests of system-wide physiological responses.
5. Investigate epigenetic regulation of genes.

Prerequisites: At least one course in Cell and/or Molecular Biology. Recommended (concurrently or subsequently): BIO 520 and a course in Statistics.

Major themes.

1. Entrez Gene, BLAST and other NCBI bioinformatics tools
2. Comparison of mRNA expression profiling techniques
3. Analysis of changes in alternative splicing frequencies
4. Design and statistical analysis of expression profiling experiments
5. Bioinformatics of microarray data
6. Analysis of genetic variation: copy number and single nucleotide polymorphisms (SNPs)
7. Epigenetics and the control of gene expression

Methods of instruction. Approximately half of the class sessions will be didactic lecture. The remainder will be computer lab exercises to allow hands-on instruction in bioinformatics tools and analysis/visualization tools for genomics data. Some material may also be provided on-line or via assigned readings. Out-of-class problem sets will be an integral part of the course. A typical problem set will consist of questions that require using the computational tools taught to produce a desired result.

Textbook: None required. Some readings from the primary scientific literature may be assigned.

Dead Week: This course adheres to university policy about the absence of assignments and tests during the week prior to finals week.

Course Policies:

Attendance, absences, excused absences, verification of absences, and make-up work. Attendance is not recorded or graded, but your instructors work very closely with students in this course and will notice if you are absent. Do us the courtesy of informing us when and why you will be absent. For excused absences (most often due to illness, death of immediate family, or University-related travel; see Senate Rule 5.2.4.2), you will be permitted to make-up any graded assessments that were missed if appropriate verification of the excuse is submitted to the course directors. Note that make-up assessments are often not identical to the original form of assessment, though they cover the same material. An "I" grade will not be assigned to students simply because they miss an examination.

Performance assessment.
Midterm exam, 20%; Final exam (not cumulative), 20%; Final project report, 30%; Homework assignments, 30%.

The grading standards to be employed for the course are as follows:
A: 85 -100%
B: 70 - 84.9%
C: 55 - 69.9%
D: 50 - 54.9%
E: below 50 %

Exams, assignments, and final project. The exams consist of all styles of questions, from True/False to essay questions. Homework assignments typically require using the computational tools taught in the course to obtain a specific answer or output. You will be given specific instructions for each assignment on how to submit your work and on what format must be used. The final project is a set of genomics data that the student must analyze using the tools and procedures taught in the course. Interpretation of the overall biological significance of the outcome of the data analysis in the final project is not required, however.

Regrading. Challenges to a grade can be submitted for a reevaluation if it is deemed that a mistake has been made in the original grading. Written explanations of the perceived mistake are best. Upon submission of a challenge, the entire examination may be subject to reevaluation. Examinations for regrading must be submitted within two weeks (14 days) of the return of the graded exam and to the course directors only.

Classroom behavior. This course is taught in a laboratory setting and encourages interactions between all involved. Please do so. Ask questions about the material of your instructors and of each other. Contribute to our discussions, but always in ways that are civil and respectful of each other and our differences. Personally demeaning behavior or behavior that risks damage to the computers placed in your care will not be tolerated.

Academic honesty. No forms of dishonesty will be tolerated. The minimum punishment for cheating on an exam or plagiarism on an assignment is an E for the assignment on which the offense occured. For a detailed definition and explanations of plagiarism, the submission of material as your own that was instead copied or closely paraphrased without citation from some other source, see http://www.uky.edu/Ombud/Plagiarism.pdf and http://wps.prenhall.com/hss_understand_plagiarism_1/0,6622,427064_,00.html.

Blackboard, a software program designed for facilitating course administration, will be used in this course. You must be able to access the Blackboard course site in order to view *posted lecture notes*, *assignments* (exercises, study questions, room assignments for discussion sessions and exams) and *other announcements*. You can find Blackboard at https://elearning.uky.edu/. If you have difficulty gaining access to Blackboard, contact the UKIT helpdesk.

Academic Integrity:
Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: http://www.uky.edu/Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Part II of Student Rights and Responsibilities (available online http://www.uky.edu/StudentAffairs/Code/part2.html) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student's assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Excused Absences:
Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Information regarding dates of major religious holidays may be obtained through the religious liaison, Mr. Jake Karnes (859-257-2754).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Verification of Absences
Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.

Accommodations due to disability :
If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Lecture Topics

Th	Aug. 25	Physiological Genomics, the new systems biology	McClintock*
Tu	Aug. 30	NCBI Bioinformatics Tools	McClintock*
Th	Sep. 1	NCBI tools lab	McClintock
Tu	Sep. 6	BLAST tools Lab	McClintock
Th	Sep. 8	GeneChip Microarrays	Chen
Tu	Sep. 13	Designing Expression Profiling Experiments	McClintock*
Th	Sep. 15	Experimental Designs – student presentations	McClintock
Tu	Sep. 20	Statistical Analysis of Transcriptome Data I	Stromberg*
Th	Sep. 22	RNA quality test Lab (HSRB 156)	Chen
Tu	Sep. 27	Statistical Analysis of Transcriptome Data II	Stromberg
Th	Sep. 29	Statistical Analysis of Transcriptome Data III	Stromberg
Tu	Oct. 4	Data Clustering versus pattern matching	Stromberg
Th	**Oct. 6**	**Midterm Exam**	
Tu	Oct. 11	Massively Parallel Data Analysis	Blalock
Th	Oct. 13	Massively Parallel Databases: GEO	Blalock
Tu	Oct. 18	Data Lab 1	Blalock*
Th	Oct. 20	Data Lab 2	Blalock
Tu	Oct. 25	Data Lab 3	Blalock
Th	Oct. 27	NetAffx lab	Chen*
Tu	Nov. 1	Functional Bioinformatics: DAVID 2.0 tool lab	Chen
Th	Nov. 3	RNAseq	Chen
Tu	Nov. 8	RNAseq Lab	Chen
Th	Nov. 10	mRNA splice variant analysis	Chen
Tu	Nov. 15	Alternative splicing lab	McClintock/Heron
Th	Nov. 17	Systems Biology	Black
Tu	Nov. 22	Systems Biology: Case study	Black
Th	Nov. 24	Thanksgiving holiday – no class	
Tu	Nov. 29	Epigenetics	McClintock
Th	Dec. 1	Epigenetics: Chromatin immunoprecipitation	McClintock
Th	**Dec. 1**	**Final Project Reports Due**	
Tu	Dec. 6	Epigenetics methods: Tiling arrays and ChIP-Chip	Chen
Th	Dec. 8	SNPs and Genetic Variation	Chen
Tu	**Dec. 12**	**Final exam; CN 602J, 3:30 – 5:30pm**	

*Assign a Homework Problem Set