Dear Dr. O'Palka and the Committee,

Please find enclosed a new course request for G855 Experimental Design and Research Biostatistics. As you know, we are introducing an open enrollment system, the Indiana University School of Medicine BioMedical Gateway (IBMG) program. IBMG students join a common first-year community and will take a core first semester curriculum. In the second semester, students choose modular courses to track towards their areas of interest. The curriculum also includes professional skills, career development, and ethics. This course will be one of these components. First year students will have the freedom to choose laboratories from any Ph.D. program for 3 research rotations. At the end of the year, students will be able to join any of the Ph.D. programs. It has been the experience of other schools that this approach results in a happier community of graduate students and in a higher quality of student. Further, the program will make graduate study at the IUSM better reflect the interdisciplinary nature of biomedical research. Incoming students will be able to focus on a research area, such as cancer, and will have the freedom to consider joining labs with different Ph.D. affiliations who work on those topics. It is also expected that the open enrollment system will promote research collaborations between IUSM laboratories because there will be an increased sense of community and an improved contact network within the graduate student population. In addition, the sharing of resources will allow the IUSM to strengthen its recruiting efforts with a goal of improving student numbers and quality. The system will improve the attractiveness of graduate study at the IUSM by offering students more choice and flexibility in their degree programs.

The course will be open to students from other IUPUI graduate programs. Letters from the chairs of the IUPUI Departments of Biology and Mathematics stating that there is no conflict with their offerings are included.

Thank you for your consideration – please contact me if I can help with any questions.

Simon J. Rhodes, Ph.D.
Associate Dean for Graduate Studies
Indiana University School of Medicine
srhodes@iupui.edu
New Course Request

Indiana University

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

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

3. Course Number: 6855 (must be cleared with University Enrollment Services)
4. Instructor: J. Williams

5. Course Title: Experimental Design and Research Biostatistics

Recommended Abbreviation (Optional) (Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year): fall 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 course will provide students with a functional understanding of experimental design and statistical testing in the biological sciences. Students will learn to discern appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.

11. Lecture Contact Hours: Fixed at 1 or Variable from _______ to _______
12. Non-Lecture Contact Hours: Fixed at _______ or Variable from _______ to _______
13. Estimated enrollment: 40 of which 100 percent are expected to be graduate students.
14. Frequency of scheduling: annually. Will this course be required for majors? yes

15. Justification for new course: Restructuring of graduate programs

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: [Signature]

Date 11/13/2007

Department Chairman/Division Director

Date

Dean of Graduate School (when required)

Approved by: [Signature]

Date 11/14/07

Dean

Chancellor/Vice-President

Date

University Enrollment Services

Date

University Enrollment Services Final—White; Chancellor/Vice-President—Blue; School/Division—Yellow; Department/Division—Pink; University Enrollment Services Advance—White

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.
I. **Title:** G855 Experimental Design and Research Biostatistics  
   Course number: G855  
   Director: James C. Williams, Jr.

Prerequisites: Completion of the BioMed I,II,III courses (G715, G716, G717) or consent of instructor

II. **COURSE DESCRIPTION AND RATIONALE**

This course will provide students with a functional understanding of experimental design and statistical testing in the biological sciences. Students will learn why a thoughtful approach to the design of their experiments and a rigorous, unbiased testing of their results are both important to their work and future careers. Students will receive an introduction to basic statistical theory with a practical focus on interpreting printouts from a variety of statistical programs (rather than a focus on students carrying out their own calculations). Practical examples of experimental design and statistical testing—both good examples and bad—will be worked through for a variety of real situations in biomedical research.

**One line description:** This course is an introduction to proper experimental design and appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.

III. **EDUCATIONAL OBJECTIVES**

- To raise awareness in students in the biomedical sciences of the importance of experimental design and statistical analysis in experimental work.
- To guide the students in thinking through examples of good and bad designs of experiments in the biological sciences.
- To guide the students in thinking through examples of good and bad use of statistics in the biological sciences.
- To familiarize the students with the concepts underlying common statistical tests so that they understand the reasons for applying one test versus another.
- To equip the students to analyze printouts from existing statistical programs, so that they can appropriately glean bottom-line information from common statistical tests.

IV. **COURSE CONTENT:**

Problem sets for this course will utilize printouts from a variety of statistical programs, requiring the students to become functional at looking for the ‘bottom line’ on such a display, and expecting them to learn to reason through the applicability of various tests.

**Week1**  
Introduction. Purpose of statistical tests. Examples of studies done in vain. Emphasis in this session will be to engage the students in discussion, and help them to see for themselves the value of making sure that their experimental designs are valuable and that their data are interpreted correctly.
Assignment: students will find three papers in their field, and describe the design of the experiments, and the statistical tests used.

Week 2  Basic statistical theory. Study design.
       Assignment: reading.

Week 3  Basic statistical theory II. Concepts of mean and variance. Confidence intervals & hypothesis tests. Appropriate error terms: within and between experiments
       Assignment: problem set utilizing statistical printouts.

Week 4  Basic statistical theory III. Comparing two means.
       Assignment: problem set utilizing statistical printouts.

Week 5  Basic statistical theory IV. Analysis of Variance.
       Assignment: problem set utilizing statistical printouts.

Week 6  Basic statistical theory V. Linear regression and correlation.
       Assignment: problem set with regression and correlation.

Week 7  Basic statistical theory VI. Multiple regression. Ad hoc testing of data sets.
       Assignment: problem set with ad hoc testing and multi-way ANOVA.

Week 8  Basic statistical theory VII. Non-linear fits. Emphasis on dose-response curves.
       Assignment: problem set with dose-response curves.

Week 9  Mid-term exam.

Week 10 Neuro examples—dose response.
       Assignment: critique of assigned paper.

Week 11 Molecular examples—gel densitometry.
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Week 12 Biochemistry example
       Assignment: critique of assigned paper.

Week 13 Genetics example
       Assignment: critique of assigned paper.

Week 14 Mouse study—bone morphometry
       Assignment: critique of assigned paper.

Week 15 Power and sample size determination. How many times should you repeat an experiment? How many animals, runs, gels, tests do you need to do?

Final exam
V. REQUIRED AND RECOMMENDED TEXTS:

Recommended: *Basic and Clinical Biostatistics* by B. Dawson-Saunders and R.G. Trapp

VI. EVALUATION AND GRADING:

Student grades in the course will be determined by two examinations, each covering approximately one-half of the material with no comprehensive final. Students will also be evaluated on class presentations and discussion for 10% of final grade. Exam will be a combination of short answer/fill in the blank questions and short essay questions. Each exam will contribute 45% of the final grade. 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>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92.99</td>
</tr>
<tr>
<td>B+</td>
<td>87-89.99</td>
</tr>
<tr>
<td>B</td>
<td>75-86.99</td>
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<tr>
<td>C</td>
<td>60-74.99</td>
</tr>
<tr>
<td>D</td>
<td>50-59.99</td>
</tr>
<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:


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
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.
Re: new course request

From: Lees, Norman D
Sent: Thursday, November 08, 2007 2:36 PM
To: Rhodes, Simon J
Subject: Re: new course request

Simon,

There are no problems with overlap in Biology courses.

Doug

Dear Ben and Doug,

We are putting in a new course request to the IU graduate school for G855 Experimental Design and Research Biostatistics. This one credit fall course will serve our IUSM PhD biomedical research students as part of our new graduate curriculum. Any other IUPUI students will of course be welcome. The philosophy will be very example based - students will bring examples from their own research labs to class. The course director will be James Williams - and others involved include Barry Katz and Gerry Oxford. Here is an outline:

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Final exam

I would appreciate it if you would please check over the content and, if you agree, please send me a note saying that there is no overlap with your courses that I can include with our submission.

Thanks,
Simon

*********************************************************

Simon J. Rhodes, Ph.D.

Associate Dean for Graduate Studies

Indiana University School of Medicine

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Rhodes, Simon J

From: Benzion Boukai [boukai@math.iupui.edu]
Sent: Tuesday, November 13, 2007 7:58 PM
To: Rhodes, Simon J
Cc: 'Andrea Brian'
Subject: RE: new course request

Simon, 
Naturally, this is always some topical overlap with such statistic courses—but not at the level, focus or emphasis that would be considered as course overlap (with any of our courses).

Many thanks,

Ben Boukai

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From: Rhodes, Simon J [mailto:srhodes@iupui.edu]
Sent: Thursday, November 08, 2007 2:42 PM
To: Boukai, Benzion; Lees, Norman D
Cc: Hodgin, Janice Ann
Subject: new course request

Dear Ben and Doug,

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Thanks,
Simon

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

11/14/2007