Wilkes University Curriculum Committee

PROPOSAL SUBMITTAL FORM

Directions:

- Use this set of forms for all proposals sent to the Curriculum Committee.
- Pages 1-3 of this document are required. Any unnecessary forms should be deleted from the packet before submissions. If multiple forms are needed (course addition, course deletion, etc), simply copy and paste additional forms into this packet.
- Note that all new programs (majors and minors), program eliminations, significant program revisions and all general education core revisions must be reviewed and approved by the Provost and Academic Planning Committee (APC) prior to submission to the Curriculum Committee. The Provost will make the decision if a program revision requires APC review.
- **Completed and signed forms are due no later than the second Tuesday of every month. Submit one signed original hard copy and a scanned electronic copy with all signatures to the Chair of the Curriculum Committee.**

1. Originators:

Dr. Del Lucent, Dr. Gregory Harms, Dr. William Terzaghi
Department of Electrical Engineering and Physics / Bioengineering Program
Tel: 570-408-4834. 570-408-4828, 570-408-4762
Email: del.lucent@wilkes.edu, gregory.harms@wilkes.edu, william.terzaghi@wilkes.edu

2. Proposal Title: **Addition of elective course BEGR 200: Principles of Biology for Engineers**

3. Check only one type of proposal: (double click on the appropriate check box and change default value to "checked").

☐ New Program. (Major or Minor Degree Programs). This requires prior review and approval by the Provost and APC.
☐ Elimination of Program. (Major or Minor Degree Programs). This requires prior review and approval by the Provost and APC.
☐ Program Revision. Significant revisions to a program require review and approval by the Provost. The Provost determines if review and approval by APC is necessary.
☐ General Education Revision. Submissions only accepted from the General Education Committee (GEC). Must be reviewed and approved by the Provost.
☐ Creation of new departments, elimination of existing department. This requires prior review and approval by the Provost and APC.
☒ Course additions or deletions not affecting programs (such as elective courses, transition of "topics" courses to permanent courses).
☐ Change in course credit or classroom hours.
☐ Incidental Changes. Includes changes in course/program title, course descriptions, and course prerequisites. (Although these changes do require approval by the Curriculum Committee, they do not go before the full faculty for approval).
☐ Other (Specify)

4. Indicate the number of course modification forms that apply to this proposal:

__1__ Course Addition Form (plus syllabi)
_____ Course Deletion Form
_____ Course Change Form

5. Executive Summary of Proposal.

Briefly summarize this proposal. The breadth and depth of this executive summary should reflect the complexity and significance of the proposal. Include an overview of the proposal, background and reasoning behind the proposal and a description of how the proposal relates to the mission and strategic long-range plan of the unit and/or university. For incidental changes a one or two sentence explanation is adequate.

We aim to offer a new 200 level engineering elective course entitled BEGR 200: Principles of Biology for Engineers. With the success of the existing MS in Bioengineering a need has arisen to develop an undergraduate biology course specifically designed for engineers. With new Wilkes University engineering faculty pursuing research at the interface of biology and other engineering disciplines (such as electrical engineering, mechanical engineering, and materials engineering) the faculty of the Department of Electrical Engineering and Physics believe that it would be prudent to offer an introductory biology course that takes advantage of an engineering student's quantitative and analytical skills. Not only will this strengthen the interdisciplinary training of existing engineering programs by broadening their education in basic sciences (a trend observed at some of the most competitive undergraduate engineering programs in the world), it will also assist with further development of bioengineering in the College of Science and Engineering.

6. Other specific information. (Not applicable for incidental changes.)

What other programs, if any, will be affected by this proposal? Describe what resources are available for this proposal. Are they adequate? What would be the effect on the curriculum of all potentially affected programs if this proposal were adopted? Include any potential effects to the curriculum of current programs, departments and courses.

Since this is a 200 level introductory course offered mainly to engineering majors, there will be no impact on non-engineering programs. As it stands, electrical and mechanical engineering students do not have the ability to take two 4-credit general introductory biology courses. Furthermore, while these courses are excellent and rigorous, the diverse student population attending these them precludes some of the quantitative exercises that would be most useful for engineers. Thus we believe that nearly every student who would enroll in this course will be an engineering major of some sort. MTH 111 and CHM 115/CHM118 are current prerequisites for all engineering programs and thus would not be affected.

7. Program Outline. (Not applicable for incidental changes).

A semester-by-semester program outline as it would appear in the bulletin for a new program or any modified program with all changes clearly indicated.

8. Signatures and Recommendations. (please date)
   - Signatures of involved Department chair(s) and Dean(s) indicate agreement with the proposal and that adequate resources (library, faculty, technology) are available to support proposal.
   - If a potential signatory disagrees with a proposal he/she should write "I disagree with this proposal" and a signed statement should be attached to this submission.

Dr. David Carey, Chair Dept. of EE & Physics — 3/18/15

Print Name/Title — Signature — Date

Department chair(s) of all potentially affected programs

Dr. Terese Wignot,
Interim Dean College of Science & Engineering — Terese M Wignot — 3/18/15

Print Name/Title — Signature — Date

Dean (s) of any potentially affected College/School.

Ms. Susan Hritzak, Registrar — Susan Hritzak — 3-18-15

Print Name — Signature — Date

Registrar

Print Name — Signature — Date

Provost (For new programs, significant revisions and revisions to the General Education Program revisions only).

Provost should check here ____ if this proposal is a program revision AND the significance of the revision requires review and approval by APC prior to Curriculum Committee.

Print Name — Signature — Date

Chair, Academic Planning Committee. For new programs, program revisions sent via the provost. Signature indicates that the proposal has been reviewed and approved by APC.

Print Name — Signature — Date

Chair, General Education Committee. For revisions to General Education program only. (Signature indicates that the proposal has been approved by GEC).

Wilkes University Curriculum Committee
COURSE ADDITION FORM – page 1

1. Course Title: **Official title for course – as opposed to the popular title**

2. Course Number: **BEGR 200**
   Coordinate with Registrar to insure course number is available

3. Course Credit Hours: **3**
   Classroom Hours **X** Lab Hours **X**
   Other_____

4. Course Prerequisites: **CHM 115 or CHM 118, MTH 111**

5. Course Description (as proposed for the Bulletin): **Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.**

This course serves as a general introduction to molecular, cellular, and organismal biological concepts for engineering students. Topics are presented in the context of engineering problems using well-known physical, mathematical, and engineering concepts as a bridge to understanding. This course aims to provide students with basic experience needed for upper-level studies in synthetic biology, biomedical engineering, biomechanics, biomaterials, or biophysics. Topics covered include macromolecular structure, cellular organization & communication, cloning, metabolic engineering, biomechanics, biofluidics, and bioelectronics. Three hours of lecture/laboratory per week.

BEGR 200 Principles of Biology for Engineers

Course Syllabus Spring 2016

Location & Meeting Time

- T R 9:00 – 9:50 A.M. SLC 380
- 2 hour lab TBA

Instructor Information

- Dr. Del Lucent
- Office: SLC 231
- Office Phone: 570.408.4834
- Email: del.lucent@wilkes.edu
- Webpage: http://www.lucentlab.org
- Office Hours: by appointment

Course Description

This course serves as a general introduction to molecular, cellular, and organismal biological concepts for engineering students. Topics are presented in the context of engineering problems using well-known physical, mathematical, and engineering concepts as a bridge to understanding. This course aims to provide students with basic experience needed for upper-level studies in synthetic biology, biomedical engineering, biomechanics, biomaterials, or biophysics. Topics covered include macromolecular structure, cellular organization & communication, cloning, metabolic engineering, biomaterials, biomechanics, biofluidics, and bioelectronics. *Four hours of lecture/laboratory per week.*

Prerequisites

- CHM 115 or CHM 118, MTH 111

Course Objectives

1. Demonstrate understanding of basic biological processes and terminology.
2. Apply engineering concepts to biological systems and problems.
3. Demonstrate an understanding of the physical scales of biological entities and processes and how they differ from those found in other engineering problems.
4. Show familiarity with the most common procedures found in bioengineering laboratories and to apply quantitative modeling and analysis methods to the data obtained from these procedures.
5. Demonstrate an ability to communicate effectively about biological concepts so as to enable effective discussion between biologists and engineers.

Textbooks

- Required texts:
  - New Biology for Engineers and Computer Scientists by Aydin Tözeren and Stephen W. Byers, ISBN 0130664634
  - Engineering Physiology by K. E. Kroemer-Elbert, H. J. Kroemer, Kroemer, ISBN 3642128823

Course Assessment & Grading

Coursework Composition

Attendance & Participation	15%
Homework	20%
3 Exams	30%
Final Exam	15%
Lab Reports	20%

*Grading Scale**

4.0	90% and above
3.5	85 – 89%
3.0	80 – 84%
2.5	75 – 79%
2.0	70 – 74%
1.5	65 – 69%
1.0	60 – 64%
0.0	59% and below

**Note when calculating your final grade I will always round any fraction of a percentage up to the next 1%*

Attendance Policy

Attendance of all lectures periods is mandatory. The instructors must excuse all absences for you to receive credit for attendance and to be allowed to make up any missed work. Repeated absence is cause for a failing grade in the course. Please see the Wilkes University Student Handbook for more information on this policy. Furthermore, courses such as this benefit significantly from in-class discussion. To encourage this, class participation will be rewarded with bonus points at the end of the semester. *Students can earn up to 2 percentage points to be applied to their final grade based on class participation.*

Homework

The homework for this course is designed as a supplemental learning exercise (as opposed to merely a test of understanding of in class material). Homework is designed to be an individual endeavor. You may seek help from your instructors or a classmate if you are stuck on a problem, but you must ultimately do your own work. Plagiarism of homework will incur severe penalties (please see the section on academic honesty below). I will drop your lowest homework grade when computing your average. *Late homework will be penalized at a rate of 25% per day.*

Exams

There will be three in-class exams and a cumulative final exam. Each exam will feature multiple-choice problems, short-answer problems, and a long-answer/essay problem. The goal of the final exam is to ensure that the "big picture" themes of the course are understood and connections between engineering and biology are made. I will drop your lowest grade when computing your average (*except a zero, you must take every exam*).

Laboratory Experiments

There will be 8 laboratory experiments performed in this class with the aim of showing students how a biological laboratory setting functions, but also to show students how they may apply engineering concepts to biological systems. Each laboratory report will be a formal typewritten report submitted in the format specified on the course webpage. Just as is the case for homework assignments, laboratory reports are an individual endeavor. Students may share data with their laboratory partners and discuss analysis and interpretation of data together, but the final written report must be the work of an individual student working on their own. Also, please note that due to the complexity of the experiments, *make up labs will not be offered*. *Late reports will be penalized at a rate of 25% per day.*

Tentative Course Schedule

Week	Topic	Laboratory Experiment	Exam or Assignment
1	Introduction & Review		
2	Biological Macromolecules I	Quantifying Macromolecules	Homework 1
3	Biological Macromolecules II		Homework 2, Lab Report 1
4	Cellular structures and processes I	Enzyme kinetics & COPASI	***Exam 1***
5	Cellular structures and processes II		Lab Report 2
6	Gene circuits	Genotyping with PCR	Homework 3
7	Metabolism and cellular communication I	iGEM I	Homework 4, Lab Report 3
8		*Spring Break*	
9	Cellular growth and division	iGEM II	***Exam 2***
10	Systems biology techniques		Homework 5, Lab Report 4
11	Multicellular organisms and tissues	Metabolism & blood pressure	Homework 6
12		*Holiday Break*	
13	Biomaterials & biocompatibility	Modeling biomechanical systems	Lab Report 5, ***Exam 3***
14	Biomechanics: skeletons and muscles		Homework 7
15	Bioelectronics: nerves	Neurons and Effective Circuits	Lab Report 6, Homework 8
16	Biofluidics: circulation and respiration		Homework 9
17	Finals Week		Lab report 7, ***Final Exam***

Academic Honesty

Academic honesty is at the very core of a successful learning experience and is also fundamental to establish the reputation of students, faculty, programs, and the university as a whole. As such, cheating of any kind will not be tolerated and will incur severe penalties. Students caught cheating on an exam will receive an immediate failing grade for the course. Evidence of plagiarism on written assignments (as defined in the Wilkes University Undergraduate Student Handbook) will also incur the same penalty. All instances of academic dishonesty will be reported to the student's advisor, as well as the Chair of the Department of Electrical Engineering and Physics, the Dean of the College of Science and Engineering, and the Dean of Student Affairs. I strongly encourage all students to review the university policy on academic dishonest as stated in the Wilkes University Undergraduate Student Handbook.

Final Thoughts

With the existence of our MS in Bioengineering, our 4+1 program in Bioengineering, and the new faculty in the department with bioengineering research interests, we wish to offer an introductory biology course for engineers. Rather than suggesting engineers to take existing general biology courses we think a biology course that takes advantage of an engineering student's quantitative and analytical skills would be a great idea. Not only will this strengthen the interdisciplinary training of existing engineering students by broadening their education in basic sciences (a trend observed at some of the most competitive undergraduate engineering programs such as those at Stanford, MIT, and U.C. Berkeley), it will also prepare students to work with biologists and prepare for further work as bioengineers.