Wilkes University Curriculum Committee

PROPOSAL SUBMITTAL FORM

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2. Proposal Title: “4 + 1” Plan for Master’s Degree in Bioengineering

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:

   _______ Course Addition Form (plus syllabi)
   _______ Course Deletion Form
   _______ Course Change Form
5. Executive Summary of Proposal.

We propose creating a “4+1” track to the M.S. degree in Bioengineering (BEGR), in which undergraduates may use Bioengineering courses taken for undergraduate credit to “double-count” towards a master’s in Bioengineering as long as they were taken at the master’s level. This allows students to complete an M.S. in Bioengineering in 5 years with suitable planning, which may be a valuable recruiting tool. It may also serve as an honors program in the sciences and engineering, since only qualified students will be accepted and retained in the program. It will also be at the very least budget-neutral, since it will not entail any new course offerings or faculty hires.

Multiple departments in the CSE at Wilkes University combined efforts in 2012 to create a new master’s degree in bioengineering. This is a unique bioengineering master’s degree program: a dual-track program that trains either engineers or biologists to become bioengineers. It draws on the strengths of the Wilkes University College of Science and Engineering: primarily engineering and biology, but also chemistry, environmental sciences and mathematics. The bioengineering master’s degree represents new outreach into an area that receives support from local and regional industry, has support from local, regional, national and international students, and is supported by existing faculty with distinguished reputations in the field. As Wilkes University is the sole regional university with a degree-granting and accredited engineering program, we can enhance our edge in the region by capitalizing on our strength in engineering bachelor’s and master’s programs supported by our equally-strong bachelor’s programs in biology. The proposed 4+1 program will potentially increase this edge by providing qualified students the opportunity to graduate with an MS degree in this rapidly-growing field in just five years.

The program administration is housed within the Department of Electrical Engineering and Physics but has supporting faculty from the Departments of Biology, Mechanical Engineering and Engineering Management, Environmental Engineering and Earth Sciences, Chemistry and Mathematics.

The programs, courses and sequences we offer in this dual-track bioengineering master’s degree are comparable to our nearest competitors in Northeast Pennsylvania but are unique in that our program has offerings for both engineering and biological scientists instead of just one or the other. The individual course track offering for the engineers is focused on and entitled, Biomedical Engineering. Similarly, the course track for the biological scientists is focused on and entitled Cell/Metabolic Engineering.

Since the program started in the fall of 2012, many undergraduates have taken Bioengineering courses for upper level credit towards their undergraduate degrees. These students, as well as prospective students and their parents, want to know if these courses taken for undergraduate credit may also be “double-counted” for graduate credit. When the original document was approved in March of 2012, the provost also approved the measure that graduate-level Bioengineering courses taken as undergraduate courses can indeed be used if a student is accepted into the Bioengineering Program.
This document uses the provost’s declaration from 2012 to create a “4 + 1” plan that sets the requirements for undergraduates obtaining majors in Biology, Electrical Engineering and Mechanical Engineering (and possibly other science and engineering majors with suitable advising) to take Bioengineering classes as undergraduates that will also count towards their graduate degree. Students will need to declare their intention to enroll in the 4 + 1 program prior to taking these classes and then take them at the master’s level. Undergraduates may declare their intention to enroll in the 4 + 1 program at matriculation, or at any time prior to the start of their junior year. Then, as long as these students have: i) taken the prescribed bioengineering courses at the master’s level as undergraduates, ii) maintain a grade point average of over 3.0 and have grades of better than 3.0 in each of their Bioengineering courses as undergraduates and iii) have completed their undergraduate degrees in four years in the fields of either Biology, Biochemistry, Electrical Engineering or Mechanical Engineering, they will be automatically accepted into the Bioengineering Program. However, the Biology and Biochemistry majors will only be automatically accepted into the Cell/Metabolic Engineering Track, and the Mechanical and Electrical Engineers will only automatically be accepted into the Biomedical Engineering Track. This plan thus creates a path for these students to fully complete a Bioengineering Master’s Degree in a single fifth year of study.

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

The Department of Biology provides supporting faculty as well as housing part of the laboratory and research facilities for the Cell/Metabolic Engineering Track. Furthermore, within the program, assistance from the Department of Chemistry, primarily for the instruction of necessary chemistry and biochemistry courses, as well as research in possible areas of biochemistry, bioinformatics and bio-computational engineering is planned. Lastly, it is expected that the Department of Mathematics will also contribute faculty to support courses and research in the areas of bioinformatics pertaining to the Cell/Metabolic Engineering track. Potentially, this program might be inviting for the School of Pharmacy or might even be able to exchange resources with them.
7. Program Outline.
These outlines are the sequences and requirements of the normal two year program.

Course Track: Biomedical Engineering

First Semester
1. Introduction to Bioengineering – BEGR 409
2. Integrated Product Development – BEGR 411
3. Applied Engineering Analysis – BEGR 401

Second Semester
1. 3D Modeling of Human Anatomy and Physiology – BEGR 415
2. Biofluidics and Microfluidics – BEGR 421
3. Biomedical Devices and Design – BEGR 488

Third Semester
1. Mechatronics - BEGR 451
2. Imaging in Biomedicine – BEGR 474
3. Thesis/Project (3 Credits) - BEGR 599

Fourth Semester
1. Elective – eg. BEGR 408, BEGR 452, Engineering Graduate Course
2. Elective – eg. BEGR 477, Engineering Graduate Course
3. Thesis/Project (3 Credits) – BEGR 599

Course Track: Cell/Metabolic Engineering

First Semester
1. Introduction to Bioengineering – BEGR 409
2. Integrated Product Development – BEGR 411
3. Bioinformatics – BEGR 430

Second Semester
1. Molecular Biology – BEGR 424
2. Biochemistry – BEGR 465
3. Cellular Biophysics – BEGR 477

Third Semester
1. Bioengineering Experimentation and Analysis – BEGR 501
2. Thesis Research (3 credits) – BEGR 599
3. Elective – eg. BEGR 474, BEGR 426, BEGR 427, BEGR 429

Fourth Semester
1. Molecular and Cellular Bioengineering – BEGR 502
2. Elective – eg. BEGR 426, BEGR 427, BEGR 429
3. Thesis Research (3 credits) – BEGR 599
Plan for Mechanical and Electrical Engineers into the “4 +1” Program

Electrical Engineers:

Course Plan of Bioengineering during Undergraduate Studies:

Semester 2: BEGR 200 : Biology for Engineers

Technical Elective (Semester 5): Either BEGR 411, BEGR 409 or BEGR 401

Technical Elective (Semester 6): BEGR 488

Technical Elective (Semester 6): Distribution Requirement

Technical Elective (Semester 7): BEGR 451 or BEGR 474

Distribution Requirement (Semester 7): Either BEGR 411, BEGR 409, BEGR 401 (what was not taken during Semester 5)

Technical Elective (Semester 8): BEGR 415

Technical Elective (Semester 8): BEGR 421 or BEGR 477

Fifth Year in Graduate Program:

First Semester (Fall Semester):

1. Course not done from BEGR 411, BEGR 409 or BEGR 401
2. Course not done from BEGR 451 or BEGR 474
3. BEGR - 599

Second Semester (Spring Semester):

1. Course not done from BEGR 421 or BEGR 477
2. Elective – eg. BEGR 408, BEGR 452, Engineering Graduate Course
3. BEGR – 599
Mechanical Engineers:

Course Plan of Bioengineering during Undergraduate Studies:

Semester 2: BEGR 200: Biology for Engineers

Distribution Requirement (Semester 5): Either BEGR 411, BEGR 409 or BEGR 401

Technical Elective (Semester 6): BEGR 488

Technical Elective (Semester 6): Distribution Requirement

Technical Elective (Semester 7): BEGR 451 or BEGR 474

Distribution Requirement (Semester 7): Either BEGR 411, BEGR 409 or BEGR 401 (what was not taken during Semester 5)

Technical Elective (Semester 8): BEGR 415

Free Elective (Semester 8): BEGR 421 or BEGR 477

Fifth Year in Graduate Program:

First Semester (Fall Semester):

1. Course not done from BEGR 411, BEGR 409 or BEGR 401
2. Course not done from BEGR 451 or BEGR 474
3. BEGR - 599

Second Semester (Spring Semester):

1. Course not done from BEGR 421 or BEGR 477
2. Elective – eg. BEGR 408, BEGR 452, Engineering Graduate Course
3. BEGR – 599
Plan for Biology Major 4+1: BS in Biology followed by MS in cell/metabolic bioengineering

Undergraduate Course Plan

Semester 5
1. BEGR 430
2. Cs 125
3. Bio 300 level elective
4. Phy 201 or Phy 171
5. Chm 361

Semester 6
1. BEGR 424
2. Bio 397
3. Bio 300 level elective
4. Chm 362
5. Phy202 or Phy 174

Semester 7
1. BEGR 409
2. BEGR 411
3. Bio 391
4. Distribution requirement
5. Bio 300 level elective
6. Free Elective

Semester 8
1. Bio 392
2. BEGR477
3. Bio 300 level elective
4. Free Elective
5. Free Elective

Graduate Course Plan (Year 5):

First Semester:
1. BEGR 501
2. BEGR 599 (thesis research)
3. BEGR elective

Second Semester:
1. BEGR 502
2. BEGR 599
3. BEGR elective
8. Signatures and Recommendations.

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<td>David Carey</td>
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Department chair(s) of all potentially affected programs (Dept. EE and PHY)

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<tr>
<td>Henry Castejon</td>
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<td>Mar. 10, 2015</td>
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Department chair(s) of all potentially affected programs (Dept. ME and EMGT)

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<td>Michael Steele</td>
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Department chair(s) of all potentially affected programs (Dept. Biology)

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Department chair(s) of all potentially affected programs (Dept. Chemistry)

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<td>Terese Wignot</td>
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Dean(s) of any potentially affected College/School (CSE)

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<tr>
<td>Susan Hritzak</td>
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Registrar

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<td>Anne A. Skleder</td>
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Provost (For new programs, program elimination, significant program revisions and revisions to the General Education curriculum).

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