Proposal to the Senate Educational Policy Committee

*Please replace all text in italic with appropriate information before submitting your proposal.*

*Your entries should be in regular (not italic) font.*

**PROPOSAL TITLE:**

Curriculum Revision to the Ph.D. Requirements for the Department of Bioengineering, College of Engineering

**SPONSOR:**

Rashid Bashir, Abel Bliss Professor of Engineering and Head, Department of Bioengineering, 217-333-1867, rbashir@illinois.edu

**COLLEGE CONTACT:**

Bill Buttlar, Associate Dean, Graduate, Professional, and Online Programs, College of Engineering, buttlar@illinois.edu, 333-0678

**BRIEF DESCRIPTION:**

We propose to add a 96 credit hour option to the current Ph.D. curriculum in Bioengineering to allow students a direct admit into the Ph.D. program. Currently, graduate students are required to hold an approved MS degree before they can enter the Ph.D. program. Students without an approved master’s degree must first complete our master’s with thesis program in Bioengineering before entering our Ph.D. program. The current Ph.D. curriculum is a 64 credit hour curriculum.

Under the 96 credit hour curriculum, students will complete the following requirements, which are outlined in detail in Appendix A.

- 41 credit hours of graduate level coursework
  - 21 credit hours of 500-level Bioengineering coursework
  - 20 credit hours of 400-500 level elective coursework per advisor approval
- 55 credit hours of thesis research
- Successful completion of the Qualifying, Preliminary, and Final exams.

**JUSTIFICATION:**

The motivation to add a 96 credit hour Ph.D. program is to remain competitive with our peers that offer a direct admit into their Ph.D. program from the bachelor’s degree.
Under the current curriculum, students without an approved master’s degree must first be admitted into our master’s with thesis program and then petition into our Ph.D. program. This is hindering our department from recruiting top talent to our program. Students applying to Bioengineering Ph.D. program want to be directly admitted into the Ph.D. program without the requirement of first completing the master’s degree. More than 90% of peer Bioengineering doctoral programs directly admit students to the PhD program without requiring a prior MS degree. This difference places Illinois at a distinct competitive disadvantage when recruiting top applicants who primarily desire a PhD.

In addition, the current Ph.D. program in Bioengineering delays the doctoral qualifying exam until after students complete the MS degree and have entered in the Ph.D. program. This means they complete the qualifying exam in the third year. With a direct admit into the Ph.D. program from their bachelor’s degree, this allows students to complete the qualifying exam at the end of the first year or in the beginning of the second year.

**BUDGETARY AND STAFF IMPLICATIONS:**

1) **Resources**

   a. How does the unit intend to financially support this proposal?

   *There will not be any budgetary obligations due to this change. The program implementation will be carried out with existing resources.*

   b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?

   *There are no capacity implications with respect to this proposed change. There will be no additional enrollment beyond the numbers currently supported by the department. Graduate student enrollment is limited by the number of Research Assistantships (faculty grants) and by available Teaching Assistantships.*

   c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.

   *No, there will be no additional financial obligations resulting from this change.*

   d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

   *There are no financial implications for the requested change.*
2) Resource Implications
   a. Please address the impact on faculty resources including the changes in
      numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

      *There will be no impact on faculty resources.*

   b. Please address the impact on course enrollment in other units and provide an
      explanation of discussions with representatives of those units.

      *There will be no impact on course enrollment in other units.*

   c. Please address the impact on the University Library

      *There will be no impact on the University Library*

   d. Please address the impact on technology and space (e.g. computer use,
      laboratory use, equipment, etc.)

      *There will be no impact on technology and space.*

For new degree programs only:

3) Briefly describe how this program will support the University’s mission, focus,
   and/or current priorities. Include specific objectives and measurable outcomes that
demonstrate the program’s consistency with and centrality to that mission.

4) Please provide an analysis of the market demand for this degree program. What
   market indicators are driving this proposal? What type of employment outlook
   should these graduates expect? What resources will be provided to assist students
   with job placement?

5) If this is a proposed graduate program, please discuss the programs intended use of
   waivers. If the program is dependent on waivers, how will the unit compensate for
   lost tuition revenue?

**DESIRED EFFECTIVE DATE:** August 16, 2016

**STATEMENT FOR PROGRAMS OF STUDY CATALOG:** See Appendix B
CLEARANCES: (Clearances should include signatures and dates of approval. These signatures must appear on a separate sheet. If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.)

Signatures:

[Signatures]

Unit Representative: [Signature]

[Signature]

Date: 12/2/15

College Representative: [Signature]

[Signature]

Date: 12/14/15

Graduate College Representative: [Signature]

[Signature]

Date: 2/22/16

Council on Teacher Education Representative: [Signature]

[Signature]

Date:
Appendix A: Proposed Curriculum Revisions

<table>
<thead>
<tr>
<th>Ph.D. Degree</th>
<th>Entering with approved M.S. Degree (current Ph.D. Curriculum)</th>
<th>Entering with B.S. Degree (addition to Ph.D. curriculum)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total credit towards degree</strong></td>
<td>64 hours</td>
<td>96 hours</td>
</tr>
<tr>
<td>BIOE 599 Research (minimum applied toward degree)</td>
<td>52 hours</td>
<td>55 hours</td>
</tr>
<tr>
<td><strong>Coursework</strong></td>
<td>12 hours</td>
<td><strong>41 hours</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 21 hours of 500-level BioE coursework: see approve list</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 20 hours of 400/500 elective coursework per advisor approval</td>
</tr>
<tr>
<td><strong>Other Requirements and Conditions (may overlap)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum hours of BIOE coursework</td>
<td>8 hours</td>
<td>21 hours</td>
</tr>
</tbody>
</table>

**Other requirements and conditions**

The minimum program GPA is 3.0. International Students must demonstrate English proficiency (equivalent to that necessary to be a TA—see Financial Aid) before taking the Qualifying Exam.

Ph.D. exam and dissertation requirements:
- Qualifying exam
- Preliminary exam
- Final exam
- Dissertation deposit

**Coursework* (minimum 21 hours 500-level BIOE Coursework)**
- BIOE 500 (2 semesters)
- BIOE 501
- BIOE 502
- BIOE 504
- BIOE 505
- 8 hours of BIOE electives
Appendix B:
Proposed Program of Study

bioengineering.illinois.edu

Head of Department: Rashid Bashir
Director of Graduate Studies: Deborah Leckband
Graduate Programs Coordinator: Krista Smith
1270 Digital Computer Laboratory
1304 West Springfield Avenue
Urbana, IL 61801
(217) 333-1867
E-mail: bioengineering@illinois.edu

Major: Bioengineering
Degrees Offered: M.S., Ph.D.

Major: Bioinstrumentation
Degrees Offered: M.Eng.

Graduate Concentrations: Bioengineering, Biomechanics, Cancer Nanotechnology

Medical Scholars Program: Doctor of Philosophy (Ph.D.) in Bioengineering and Doctor of Medicine (M.D.) through the Medical Scholars Program

Graduate Degree Programs
The Department of Bioengineering offers studies leading to the Master of Engineering in Bioinstrumentation (M.Eng.), the Master of Science in Bioengineering (M.S.), and the Doctor of Philosophy (Ph.D.) in Bioengineering. The Bioengineering Graduate Program provides students with educational and research experiences that integrate the sciences of biology and medicine with the practices and principles of engineering. For the M.S. and Ph.D. programs, areas of focus include Bio-imaging, Cell & Tissue Engineering, Micro and Molecular Technologies, and Computational Biology. Opportunity also exists for specializing in (1) computational science and engineering and (2) energy and sustainability engineering via the Computational Science and Engineering (CSE) Concentration and the Energy and Sustainability Engineering (EaSE) Certificate. The Medical Scholars Program permits highly qualified students to integrate the study of medicine with study for a graduate degree in a second discipline, including Bioengineering.

Admission
For the M.S. and Ph.D. programs, applicants should have an undergraduate degree in a natural science, computer science, or engineering. A minimum grade point average of 3.00 (A = 4.00) for the last two years of undergraduate study is required. Applicants should show evidence of strong quantitative skills and of serious interest in the life sciences. Applicants with a grade point average of greater than 3.00 (A = 4.00) may be considered for admission to the Ph.D. program. In addition, applicants to the Ph.D. program must submit results from the Graduate Record Examination (GRE) general test. All applicants whose native language is not English must submit a minimum TOEFL score of 97 (iBT), 243 (CBT), or 590 (PBT); or minimum International English Language Testing System (IELTS) academic exam scores of 6.5 overall and 6.0 in all subsections. Applicants may be exempt from the TOEFL if certain criteria are met. For those taking the TOEFL or IELTS, full admission status is granted for scores of 103 (TOEFL iBT) or greater, 253 (TOEFL CBT), 610 (TOEFL PBT), or 6.5 (IELTS). Limited status is granted for lesser scores and requires enrollment in English as a Second Language (ESL) courses based on an ESL Placement Test (EPT) taken upon arrival to campus.

Please see the admission requirements for the M.Eng. in Bioinstrumentation under the "Masters" tab.

Degree Requirements
For additional details and requirements for all degrees, please refer to the department's Graduate Studies Web site and the Graduate College Handbook.

Medical Scholars Program
The Medical Scholars Program permits highly qualified students to integrate the study of medicine with study for a graduate degree in a second discipline, including Bioengineering. Students may apply to the Medical Scholars Program prior to beginning graduate school or while in the graduate program. Applicants to the Medical Scholars Program must meet the admissions standards for and be accepted into both Bioengineering and the College of Medicine. Students in the dual degree program must meet the specific requirements for both the medical and graduate degrees. On average, students take eight years to complete both degrees. An application to the Medical Scholars Program will also serve as the application to the Bioengineering graduate program. Further
information on this program is available by contacting the Medical Scholars Program, 125 Medical Sciences Building, (217) 333-8146, mspo@illinois.edu or at www.med.illinois.edu/msp.

**Faculty Research Interests**

Bioengineering faculty perform research in the areas of Bio-Imaging at Multi-Scale, Molecular, Cellular and Tissue Engineering, Bio-Micro and Nanotechnology, Computational Bioengineering, and Synthetic Bioengineering. In addition to Bioengineering faculty, Department of Bioengineering has more than 50 affiliate faculty.

**Financial Aid**

For the M.S. and Ph.D. programs, qualified students may apply for financial aid in the form of fellowships, teaching and research assistantships, and waivers of tuition and service fees. All applicants, regardless of U.S. citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate spoken English language proficiency by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the iBT or IELTS, a minimum score of 4CP is required on the EPI test, offered on campus. All new teaching assistants are required to participate in the Graduate Academy for College Teaching conducted prior to the start of the semester. Please see the financial aid eligibility for the M.Eng. in Bioinstrumentation under the "Masters" tab.

**Master of Science in Bioengineering**

### Thesis Option

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOE 599</td>
<td>Thesis Research (min-max applied toward degree)</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 500</td>
<td>Graduate Seminar (BIOE 500 must be taken at least twice. A maximum of 2 hours may be applied toward the degree.)</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 501</td>
<td>Seminar Discussion</td>
<td>1</td>
</tr>
<tr>
<td>BIOE 502</td>
<td>Bioengineering Professionalism</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 504</td>
<td>Analytical Methods in Bioeng</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 505</td>
<td>Computational Bioengineering</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 506</td>
<td>Molecular Biotechniques</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 507</td>
<td>Advanced Bioinstrumentation</td>
<td>4</td>
</tr>
<tr>
<td>Elective Courses</td>
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<td>7</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>32</td>
</tr>
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### Other Requirements and Conditions

Minimum GPA: 3.0

1 For additional details and requirements for all degrees, please refer to the department's Graduate Studies Web site and the Graduate College Handbook.

### Non-Thesis Option

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 500</td>
<td>Graduate Seminar (BIOE 500 must be taken at least twice. A maximum of 2 hours may be applied toward the degree.)</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 501</td>
<td>Seminar Discussion</td>
<td>1</td>
</tr>
<tr>
<td>BIOE 502</td>
<td>Bioengineering Professionalism</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 504</td>
<td>Analytical Methods in Bioeng</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 505</td>
<td>Computational Bioengineering</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 506</td>
<td>Molecular Biotechniques</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 507</td>
<td>Advanced Bioinstrumentation</td>
<td>4</td>
</tr>
<tr>
<td>Elective Courses</td>
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<td>19</td>
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<tr>
<td><strong>Total Hours</strong></td>
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</tr>
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### Other Requirements and Conditions

Minimum GPA: 3.0
Doctor of Philosophy
Entering with approved M.S. degree

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOE 599</td>
<td>Thesis Research (min-max applied toward degree)</td>
<td>52</td>
</tr>
<tr>
<td>Elective courses</td>
<td></td>
<td>12</td>
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<tr>
<td>Total Hours</td>
<td></td>
<td>64</td>
</tr>
</tbody>
</table>

Other Requirements and Conditions

- Minimum program GPA: 3.0
- Qualifying exam
- Preliminary exam
- Final exam and dissertation defense
- Dissertation deposit

For additional details and requirements for all degrees, please refer to the department's [Graduate Studies Web site](http://graduateschools) and the [Graduate College Handbook](http://graduatecollegehandbook).

Qualifying Examination information

Entering with B.S. degree (New options being proposed)

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 599</td>
<td>Thesis Research (min-max applied toward degree)</td>
<td>55</td>
</tr>
<tr>
<td>500-level BioE courses</td>
<td>see approved list</td>
<td>21</td>
</tr>
<tr>
<td>Elective courses: At least 12 hours must be engineering graduate-level courses. See website for more details.</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>96</td>
</tr>
</tbody>
</table>

Other Requirements and Conditions

- Minimum program GPA: 3.0
- Qualifying exam
- Preliminary exam
- Final exam
- Dissertation deposit

For additional details and requirements for all degrees, please refer to the department's [Graduate Studies Web site](http://graduateschools) and the [Graduate College Handbook](http://graduatecollegehandbook).

Qualifying Examination information
December 3, 2015

Rohit Bhargava, Vice Chair
Executive Committee
College of Engineering

Dear Professor Bhargava:

My office has reviewed the following curriculum proposal submitted by the Department of Bioengineering to add a 96 credit hour option to their existing Ph.D. curriculum.

Curriculum Revision to the Ph.D. Requirements for the Department of Bioengineering, College of Engineering

We are now submitting this proposal for review by the Executive Committee.

Sincerely,

William G. Buttlar
Associate Dean
Office of Graduate and Professional Programs
PROPOSAL TITLE (Same as on proposal): Curriculum Revision to the Ph.D. Requirements for the Department of Bioengineering, College of Engineering

PROPOSAL TYPE (select all that apply below):

A. ☒ Proposal for a NEW or REVISED degree program. Please consult the Programs of Study Catalog for official titles of existing degree programs.

1. Degree program level:
   ☒ Graduate
   ☐ Professional
   ☐ Undergraduate

2. ☐ Proposal for a new degree (e.g. B.S., M.A. or Ph.D.):
   Degree name, “e.g., Bachelor of Arts or Master of Science”:

3. ☐ Proposal for a new or revised major, concentration, or minor:
   ☐ New or ☒ Revised Major in (name of existing or proposed major): Bioengineering
   ☐ New or ☐ Revised Concentration in (name of existing or proposed concentration):
   ☐ New or ☐ Revised Minor in (name of existing or proposed minor):

4. ☐ Proposal to rename an existing major, concentration, or minor:
   ☐ Major
   ☐ Concentration
   ☐ Minor
   Current name:
   Proposed new name:

5. ☐ Proposal to terminate an existing degree, major, concentration, or minor:
   ☐ Degree
   ☐ Major
   ☐ Concentration
   ☐ Minor
   Name of existing degree, major, or concentration:

6. ☐ Proposal involving a multi-institutional degree:
   ☐ New
   ☐ Revision
   ☐ Termination
   Name of existing Illinois (UIUC) degree:
Name of non-Illinois partnering institution: ____

Location of non-Illinois partnering institution:

☐ State of Illinois  ☐ US State: _____  ☐ Foreign country: _____

B. ☐ Proposal to create a new academic unit (college, school, department, program or other academic unit):

Name of proposed new unit: ____

C. ☐ Proposal to rename an existing academic unit (college, school, department, or other academic unit):

Current name of unit: _____

Proposed new name of unit: _____

D. ☐ Proposal to reorganize existing units (colleges, schools, departments, or program):

1. ☐ Proposal to change the status of an existing and approved unit (e.g. change from a program to department)

   Name of current unit including status: _____

2. ☐ Proposal to transfer an existing unit:

   Current unit’s name and home: _____

   Proposed new home for the unit: _____

3. ☐ Proposal to merge two or more existing units (e.g., merge department A with department B):

   Name and college of unit one to be merged: _____

   Name and college of unit two to be merged: _____

   Proposed name and college of new (merged) unit: _____

4. ☐ Proposal to terminate an existing unit:

   Current unit’s name and status: _____

E. ☐ Other educational policy proposals (e.g., academic calendar, grading policies, etc.)

   Nature of the proposal: _____

Revised 10/2012
February 23, 2016

Bettina Francis, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Francis:

Enclosed is a copy of a proposal from the College of Engineering and the Graduate College to revise the Ph.D. in Bioengineering.

Sincerely,

[Signature]
Kathryn A. Martensen
Assistant Provost

Enclosures

c: W. Chodzko-Zajko
B. Buttlar
R. Bashir
J. Hart
A. McKinney
February 22, 2016

Kathy Martensen
Office of the Provost
207 Swanlund MC-304

Dear Kathy,

Enclosed please find the proposal titled: “Curriculum Revision to the Ph.D. Requirements for the Department of Bioengineering”

The proposal was received by the Graduate College on December 18, 2015. It was forwarded to the Graduate College Program Subcommittee for review on January 28, 2016. The committee requested one minor revision, which was received on February 3, 2016.

The proposal was then forwarded for review at the February 18, 2016 Graduate College Executive Committee. The proposed program was found to meet campus requirements and guidelines for graduate education, and so was approved.

I send the proposal to you now for further review.

Sincerely,

Wojtek Chodzko-Zajko
Dean
Graduate College

c: B. Buttlar  
R. Bashir  
A. McKinney
December 14, 2015

Associate Dean John Hart
Graduate College
204 Coble Hall
MC-322

Via: Andreas Cangellaris, Engineering College

Dear Dean Hart:

The College of Engineering Executive Committee has reviewed and approved the following curriculum revision. We now submit for campus approval.

"Curriculum Revision to the Ph.D. Requirements for the Department of Bioengineering, College of Engineering"

Attached is a copy of the request

Sincerely yours,

Rohit Bhargava, Vice Chair
Executive Committee

Approval Recommended:

Andreas Cangellaris, Dean
College of Engineering

Bill Buttler
Rhonda McElroy
Rohit Bhargava

12-14-2015

Date