

# UNIVERSITY FACULTY SENATE FORMS

## Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: Pei Chiu phone number 831-3104

Department: Civil and Environmental Engineering email address pei@udel.edu

Date: December 17, 2012

Action: Revise a concentration

(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

Effective term 13F  
(use format 04F, 05W)

Current degree BS  
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed change leads to the degree of: BS  
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed name: N/A  
Proposed new name for revised or new major / minor / concentration / academic unit (if applicable)

### Revising or Deleting:

Undergraduate major / Concentration: Environmental Engineering – Environmental Biological and Chemical Processes concentration  
(Example: Applied Music – Instrumental degree BMAS)

Undergraduate minor: N/A  
(Example: African Studies, Business Administration, English, Leadership, etc.)

Graduate Program Policy statement change: N/A  
(Must attach your Graduate Program Policy Statement)

Graduate Program of Study: N/A  
(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

Graduate minor / concentration: N/A

**Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, highlighting the changes made to the original policy document.**

**List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?**

(Be aware that approval of the curriculum is dependent upon these courses successfully passing through the Course Challenge list. If there are no new courses enter "None")

- CHEM 220 Quantitative Analysis (3 credits)
- CHEM 221 Quantitative Analysis Lab (1 credit)
- CHEM 444 Physical Chemistry II (3 credits) (replacing CHEM 443 Physical Chemistry I, 3 credits)

CHEM 220 and 221 are prerequisites for CHEM 444, which is a prerequisite for CHEG 332 Chemical Engineering Kinetics, a required course in the concentration *Environmental Biological and Chemical Processes*.

**Explain, when appropriate, how this new/revised curriculum supports the 10 goals of undergraduate education:** <http://www.ugs.udel.edu/gened/>

N/A.

**Identify other units affected by the proposed changes:**

(Attach permission from the affected units. If no other unit is affected, enter "None")

The official prerequisites listed for CHEM 444 include PHYS 208, which is not in our curriculum.

An email from Professor John Burmeister, Associate Chair of Department of Chemistry and Biochemistry, is attached below. This email documents that students in environmental engineering who have taken PHYS 207 and an engineering statics course (e.g., CIEG 211) will be admitted into CHEM 444 without having taken PHYS 208. Both PHYS 207 and CIEG 211 are required courses in our curriculum.

Based on recent enrollment statistics, we anticipate at most 5 to 8 students per year may select this Concentration.

**Describe the rationale for the proposed program change(s):**

(Explain your reasons for creating, revising, or deleting the curriculum or program.)

In late spring 2011, the faculty senate approved a number of changes to the Bachelor's Degree in Environmental Engineering. One modification was that two of the concentrations in the major were combined into the new concentration *Environmental Biological and Chemical Processes*. These changes became effective fall 2012.

While preparing information for incoming freshman in summer 2012, a problem was noted in the new concentration: prerequisites for CHEG 332 Chemical Engineering Kinetics were **not** listed as required courses. We propose the following revisions to the curriculum for this concentration to correct the mistake.

- 1) Replace CHEM 443 Physical Chemistry I (3 credits) with CHEM 444 Physical Chemistry II (3 credits).
- 2) Add CHEM 220 Quantitative Analysis (3 credits) and CHEM 221 Quantitative Analysis Lab (1 credit).
- 3) Reduce the credit hours assigned for technical electives from 10 to 6, to keep the total credit requirement to 125 for this concentration.

**Program Requirements:**

(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and **include a side-by-side comparison** of the credit distribution before and after the proposed change.)

A side-by-side comparison of the current and the proposed curriculum for Environmental Engineering in the UD Catalog is attached below. In addition to the changes noted above, information in the UD Catalog describing when courses should be taken is incorrect for five core courses in the current curriculum. These are corrected in the revised curriculum and all proposed changes are highlighted in yellow.

**ROUTING AND AUTHORIZATION:** (Please do not remove supporting documentation )

Department Chairperson *[Signature]* Date 12/17/12  
Dean of College *[Signature]* Date 12/17/2012  
Chairperson, College Curriculum Committee *[Signature]* Date 12/17/12  
Chairperson, Senate Com. on UG or GR Studies \_\_\_\_\_ Date \_\_\_\_\_  
Chairperson, Senate Coordinating Com \_\_\_\_\_ Date \_\_\_\_\_  
Secretary, Faculty Senate \_\_\_\_\_ Date \_\_\_\_\_  
Date of Senate Resolution \_\_\_\_\_ Date to be Effective \_\_\_\_\_  
Registrar \_\_\_\_\_ Program Code \_\_\_\_\_ Date \_\_\_\_\_  
Vice Provost for Academic Affairs & International Programs \_\_\_\_\_ Date \_\_\_\_\_  
Provost \_\_\_\_\_ Date \_\_\_\_\_  
Board of Trustee Notification \_\_\_\_\_ Date \_\_\_\_\_

**Email from Professor John Burmeister, Associate Chair of Department of Chemistry and Biochemistry, allowing students with PHYS 207 and an engineering course in Statics into CHEM 444. Email is dated 7/20/2012.**

\*\*\*\*\*

Paul:

1) Yes

2) Ditto

3) If that's what I typed, it was a typo! CHEM-321 is offered fall, winter, and summer. CHEM-322 is offered spring, summer and winter.

JB

On 7/20/2012 12:12 PM, Imhoff, Paul T. wrote:  
Hello John,

We made some changes to one of the concentrations in environmental engineering in 2011 that become official in fall 2012, but we may have missed some physics prerequisites. I took my information below from UDSIS for courses taught in spring 2012 and fall 2012. Can you tell me if the following information is correct?

1) CHEM 443

"Prerequisites are CHEM120, or CHEM220 and CHEM221; MATH242 (MATH243 recommended); PHYS208 (recommended) or PHYS202."

In the past, our students have taken this course without taking PHYS208 or PHYS202, but have PHYS207, and take an engineering Statics course and MATH 243 during the same semester. Is this still acceptable?

2) CHEM 444

"Prerequisites are CHEM120, or CHEM220 and CHEM221; MATH242 (MATH243 recommended); PHYS208 (recommended) or PHYS202. "

Is PHYS207 and an engineering course in Statics sufficient to provide the needed physics background?

3) CHEM 321

In an email exchange back in spring 2010, you indicated that this course is taught both spring and fall semesters. Is this true? I did not see it listed for spring 2012.

Thanks in advance for your help! - Paul

--

John L. Burmeister  
Alumni Distinguished Professor and Associate Chairman  
Department of Chemistry and Biochemistry  
University of Delaware  
Newark, DE 19716  
(302)831-1130  
FAX (302)831-6335  
<http://www.udel.edu/chem/burmeister/jlb.htm>

Current	Revised	
<b>DEGREE: BACHELOR OF ENVIRONMENTAL ENGINEERING</b>	<b>DEGREE: BACHELOR OF ENVIRONMENTAL ENGINEERING</b>	
<b>MAJOR: ENVIRONMENTAL ENGINEERING</b>	<b>MAJOR: ENVIRONMENTAL ENGINEERING</b>	
<b>CURRICULUM</b>	<b>CURRICULUM</b>	<b>CREDITS</b>
Superior figures indicate year (1 = freshman, 2 = sophomore, 3 = junior, 4 = senior) and semester (F = fall, S = spring) in which the course should be taken.	Superior figures indicate year (1 = freshman, 2 = sophomore, 3 = junior, 4 = senior) and semester (F = fall, S = spring) in which the course should be taken.	
<b>UNIVERSITY REQUIREMENTS</b>	<b>UNIVERSITY REQUIREMENTS</b>	
ENGL 110 Critical Reading and Writing (minimum grade C-)	ENGL 110 Critical Reading and Writing (minimum grade C-)	3
First Year Experience (FYE)	First Year Experience (FYE)	0-4
Breadth Requirements	Breadth Requirements	12
Discovery Learning Experience (DLE)	Discovery Learning Experience (DLE)	3
Multi-cultural Courses	Multi-cultural Courses	3
<b>Major Requirements</b>	<b>Major Requirements</b>	
<b>Breadth Requirements</b>	<b>Breadth Requirements</b>	21
(essentially 9 credits in addition to the University Breadth Requirement.) If chosen carefully, up to 3 credits from each of the University Breadth Requirement categories may be used to simultaneously satisfy the College of Engineering Breadth Requirements for this major. Of the 21 credits, 6 credits must be at the Upper Level (usually 300-level or higher) as designated on the College of Engineering Breadth Requirement list. Of the 21 credits, 3 credits may be used to satisfy the University Multicultural Requirement (recommended for timely progress toward degree completion.) All Breadth Requirement coursework must	(essentially 9 credits in addition to the University Breadth Requirement.) If chosen carefully, up to 3 credits from each of the University Breadth Requirement categories may be used to simultaneously satisfy the College of Engineering Breadth Requirements for this major. Of the 21 credits, 6 credits must be at the Upper Level (usually 300-level or higher) as designated on the College of Engineering Breadth Requirement list. Of the 21 credits, 3 credits may be used to satisfy the University Multicultural Requirement (recommended for timely progress toward degree completion.) All Breadth Requirement coursework must	
<b>Core Courses for the Major</b>	<b>Core Courses for the Major</b>	
ENGL 410 Technical Writing	ENGL 410 Technical Writing	3 <sup>2F</sup>
MATH 241 Analytic Geometry and Calculus A	MATH 241 Analytic Geometry and Calculus A	4 <sup>1F</sup>
MATH 242 Analytic Geometry and Calculus B	MATH 242 Analytic Geometry and Calculus B	4 <sup>1S</sup>
MATH 243 Analytic Geometry and Calculus C	MATH 243 Analytic Geometry and Calculus C	4 <sup>2F</sup>
MATH 351 Engineering Math I	MATH 351 Engineering Math I	3 <sup>2S</sup>
PHYS 207 Fundamentals of Physics	PHYS 207 Fundamentals of Physics	4 <sup>1S</sup>
BISC 207 Introductory Biology I	BISC 207 Introductory Biology I	4 <sup>2S</sup>
CISC 106 General Computer Science for Engineers	CISC 106 General Computer Science for Engineers	3 <sup>1F</sup>
CHEG 231 Chemical Engineering Thermodynamics	CHEG 231 Chemical Engineering Thermodynamics	3 <sup>3F</sup>
EGGG 101 Introduction to Engineering	EGGG 101 Introduction to Engineering	2 <sup>1F</sup>
CIEG 211 Statics	CIEG 211 Statics	3 <sup>2F</sup>
CIEG 233 Environmental Engineering Processes	CIEG 233 Environmental Engineering Processes	3 <sup>2F</sup>
CIEG 305 Fluid Mechanics	CIEG 305 Fluid Mechanics	3 <sup>3F</sup>
CIEG 306 Fluid Mechanics Laboratory	CIEG 306 Fluid Mechanics Laboratory	1 <sup>3S</sup>
CIEG 315 Probability and Statistics for Engineers	CIEG 315 Probability and Statistics for Engineers	3 <sup>3S</sup>
CIEG 337 Environmental Engineering Laboratory	CIEG 337 Environmental Engineering Laboratory	3 <sup>3S</sup>
CIEG 434 Air Pollution Control	CIEG 434 Air Pollution Control	3 <sup>4S</sup>
CIEG 437 Water & Wastewater Quality	CIEG 437 Water & Wastewater Quality	3 <sup>4F</sup>

CIEG 438 Water and Wastewater Engineering	3 <sup>3F</sup>	CIEG 438 Water and Wastewater Engineering	3 <sup>3F</sup>
CIEG 440 Water Resources Engineering	3 <sup>3F</sup>	CIEG 440 Water Resources Engineering	3 <sup>3F</sup>
CIEG 461 Senior Design Project	4 <sup>4S</sup>	CIEG 461 Senior Design Project	4 <sup>4S</sup>
Beyond these core courses, one of the three concentrations listed below must also be chosen (see curricula at bottom of page):		Beyond these core courses, one of the three concentrations listed below must also be chosen (see curricula at bottom of page):	
Environmental Biological and Chemical Processes		Environmental Biological and Chemical Processes	
Environmental Facilities Design and Construction		Environmental Facilities Design and Construction	
Water Resources and Water Quality		Water Resources and Water Quality	
For the introductory chemistry courses, <b>CHEM 103/104</b> is the standard sequence. However, if a student's chemistry background is sufficiently strong, they are advised to take <b>CHEM 111/112/220/221</b> .		For the introductory chemistry courses, <b>CHEM 103/104</b> is the standard sequence. However, if a student's chemistry background is sufficiently strong, they are advised to take <b>CHEM 111/112/220/221</b> .	
the desired focus at the intermediate and advanced levels. Beyond the set of specific core technical electives for the concentration, the remaining technical electives can then be chosen to further pursue this direction of study, or to provide a more diversified environmental engineering education. All technical electives must be upper level courses in engineering, the sciences, computer science, or mathematics.		the desired focus at the intermediate and advanced levels. Beyond the set of specific core technical electives for the concentration, the remaining technical electives can then be chosen to further pursue this direction of study, or to provide a more diversified environmental engineering education. All technical electives must be upper level courses in engineering, the sciences, computer science, or mathematics.	
The chemistry courses and the core technical electives are listed below for each concentration.		The chemistry courses and the core technical electives are listed below for each concentration.	
<b>CREDITS TO TOTAL A MINIMUM OF</b>	125	<b>CREDITS TO TOTAL A MINIMUM OF</b>	125
<b>BACHELOR OF ENVIRONMENTAL ENGINEERING - ENVIRONMENTAL ENGINEERING (ENVIRONMENTAL BIOLOGICAL AND CHEMICAL PROCESSES)</b>		<b>BACHELOR OF ENVIRONMENTAL ENGINEERING - ENVIRONMENTAL ENGINEERING (ENVIRONMENTAL BIOLOGICAL AND CHEMICAL PROCESSES)</b>	
<b>BACHELOR OF ENVIRONMENTAL ENGINEERING - ENVIRONMENTAL ENGINEERING (ENVIRONMENTAL FACILITIES DESIGN AND CONSTRUCTION)</b>		<b>BACHELOR OF ENVIRONMENTAL ENGINEERING - ENVIRONMENTAL ENGINEERING (ENVIRONMENTAL FACILITIES DESIGN AND CONSTRUCTION)</b>	
<b>BACHELOR OF ENVIRONMENTAL ENGINEERING - ENVIRONMENTAL ENGINEERING (WATER RESOURCES AND WATER QUALITY)</b>		<b>BACHELOR OF ENVIRONMENTAL ENGINEERING - ENVIRONMENTAL ENGINEERING (WATER RESOURCES AND WATER QUALITY)</b>	

DEGREE: BACHELOR OF ENVIRONMENTAL ENGINEERING	DEGREE: BACHELOR OF ENVIRONMENTAL ENGINEERING		
MAJOR: ENVIRONMENTAL ENGINEERING CONCENTRATION: ENVIRONMENTAL BIOLOGICAL AND CHEMICAL PROCESSES	MAJOR: ENVIRONMENTAL ENGINEERING CONCENTRATION: ENVIRONMENTAL BIOLOGICAL AND CHEMICAL PROCESSES		
Chemical, biological and microbial aspects of contaminant behavior in natural and engineered systems.	Chemical, biological and microbial aspects of contaminant behavior in natural and engineered systems.		
<b>CURRICULUM</b>	<b>CURRICULUM</b>	<b>CREDITS</b>	<b>CREDITS</b>
See University and College requirements.	See University and College requirements.		
CHEM 103** General Chemistry	CHEM 103** General Chemistry	4	4
CHEM 104** General Chemistry	CHEM 104** General Chemistry	4	4
	CHEM 220 Quantitative Analysis		3
	CHEM 221 Quantitative Analysis Lab		1
CHEM 321** Organic Chemistry	CHEM 321 Organic Chemistry	4	4
BISC 300 Introduction to Microbiology	BISC 300 Introduction to Microbiology	4	4
CHEG 443 Physical Chemistry I	CHEG 444 Physical Chemistry II	3	3
CHEM 527 Introduction to Biochemistry	CHEM 527 Introduction to Biochemistry	3	3
CHEG 325 Chemical Engineering Thermodynamics	CHEG 325 Chemical Engineering Thermodynamics	3	3
CHEG 332 Chemical Engineering Kinetics	CHEG 332 Chemical Engineering Kinetics	3	3
Additional technical electives, including 3 cr. of engineering topics and 3 cr. of earth science*	Additional technical electives, including 3 cr. of engineering topics and 3 cr. of earth science*	10	6
*Advisor should be consulted to ensure that the engineering topic and earth science requirement is met through appropriate technical electives.	*Advisor should be consulted to ensure that the engineering topic and earth science requirement is met through appropriate technical electives.		
**Students with sufficient Chemistry background should replace these courses with CHEM 111/112/220/221/331/333.	**Students with sufficient Chemistry background should replace these courses with CHEM 111/112 and two additional credits of technical electives.		



Name \_\_\_\_\_ **ENVIRONMENTAL ENGINEERING PROGRAM** Advisor \_\_\_\_\_

Transfer Credits **Environmental Biological and Chemical Processes** (125 Hours)

Eval. by \_\_\_\_\_ Effective for EG12 and subsequent classes

Date \_\_\_\_\_ The required courses of the program are normally taught in the Fall or Spring Semesters as indicated below. Each student is responsible for *tracking* future changes in this schedule.

**FRESHMAN YEAR**

**FIRST TERM 16 credits**

Analytical Geom. & Calc. A	MATH 241 (4)	*
General Chemistry	CHEM 103 (4)	*
Intro to Engineering	EGGG 101 (2)	
Critical Reading & Writing	ENGL 110 (3)	*
Computer Science	CISC 106 (3)	

**SECOND TERM 15 credits**

Analytical Geom. & Calc. B	MATH 242 (4)	*
General Chemistry	CHEM 104 (4)	*
General Physics I	PHYS 207 (4)	*
Breadth Requirement	(3)	

\*Grade of "C-" or better required in these courses as degree requirement or as prerequisite for other courses.

**SOPHOMORE YEAR**

**FIRST TERM 17 credits**

Analytical Geom. & Calc. C	MATH 243 (4)	*
Statics	CIEG 211 (3)	
Env. Engineering Processes	CIEG 233 (3)	
Quantitative Analysis	CHEM 220 (3)	
Quantitative Analysis Lab	CHEM 221 (1)	
Breadth Requirement	(3)	

**SECOND TERM 16 credits**

Engineering Math I	MATH 351 (3)	
Introductory Biology I	BISC 207 (4)	
Prob. & Stats. for Engineers	CIEG 315 (3)	
Physical Chemistry II	CHEM 444 (3)	
Breadth Requirement	(3)	

**JUNIOR YEAR**

**FIRST TERM 16 credits**

Thermodynamics I	CIEG 231 (3)	*
Fluid Mechanics	CIEG 305 (3)	
Fluid Mechanics Lab	CIEG 306 (1)	
Water & WW Engineering <sup>c</sup>	CIEG 438 (3)	
Env. Engineering Lab <sup>c</sup>	CIEG 337 (3)	
Breadth Requirement	(3)	

**SECOND TERM 16 credits**

Intro to Microbiology	BISC 300 (4)	
Thermodynamics II	CIEG 325 (3)	
Technical Writing	ENGL 410 (3)	
Technical Elective <sup>a</sup>	(3)	
Breadth Requirement	(3)	

**SENIOR YEAR**

**FIRST TERM 15 credits**

Senior Design	CIEG 461 (2)	
Chemical Eng Kinetics	CIEG 332 (3)	
Water Resources Eng	CIEG 440 (3)	
Organic Chemistry	CHEM 321 (4)	
Water Quality Lab <sup>b</sup>	CIEG 437 (3)	

**SECOND TERM 14 credits**

Senior Design	CIEG 461 (2)	
Air Pollution Control	CIEG 434 (3)	
Intro to Biochemistry	CHEM 527 (3)	
Technical Elective <sup>d</sup>	(3)	
Breadth Requirement	(3)	

<sup>a</sup> Engineering Topics. <sup>b</sup> Course alternates: taught in odd year. <sup>c</sup> Course alternates: taught in even year. <sup>d</sup> Earth Science.

**BREADTH REQUIREMENTS (18 Credit Hours); All Breadth Requirements C- or better**

See Breadth Requirements Handout distributed by the Dean's Office: [www.engr.udel.edu/advise/breadth\\_req.html](http://www.engr.udel.edu/advise/breadth_req.html)

<b>Creative Arts &amp; Humanities (3)</b>	<b>History &amp; Cultural Change (3)</b>	<b>Social &amp; Behavioral Sciences (3)</b>
<b>Three additional courses (9 credit hours) from the categories above</b> (Note: ENGL110 and ENGL410 do not fill breadth requirements)		

**OTHER BREADTH REQUIREMENTS**

\_\_\_\_\_ General Education plan approved (T) \_\_\_\_\_ 2 courses (6 credits) above introductory level (course numbers)  
 \_\_\_\_\_ Course (3 credits) for multicultural requirement

**TECHNICAL ELECTIVES** (at least one must be in engineering)

<b>Course</b>	<b>Course</b>

**IMPORTANT NOTES:**

Technical Elective requirements for Environmental Engineering are given on the reverse side of this sheet. More complete General Education requirements should be obtained from the faculty advisor. Additional details and up-to-date information are available from the office of the Chairperson. Students may arrange (with Faculty Advisor's approval) the sequence of these and other courses when prerequisites (if any) have been met. Number of credits per term may also be adjusted to individual needs.

**SYMBOLS:** Pre-registered ( ) Course in Progress ( ) Completed and Passed ( )  
 Not Required (N) Transfer Credit (T)