

**TO:** The Faculty of the College of Engineering  
**FROM:** The School of Agricultural and Biological Engineering  
**RE** Curriculum Changes - Biological Engineering Plan of Study

The faculty of the School of Agricultural & Biological Engineering has approved the following changes to the curriculum for Biological Engineering. The requested changes to the plan of study increase the credit hours required for graduation from 128 to 129, and incorporate needed changes to the curriculum to better prepare Biological Engineering students for later course work. Specializations are introduced into the plan of study through options to fulfill plan of study requirements with courses in food science, bio-processing, pharmaceutical sciences, or life sciences.

**Summary of Changes:**

1. CS 15900 was added to prepare students for computer programming in junior and senior level ABE courses.
2. MA 26500 and MA 26600 were replaced with MA 26200 and MA 30300 to give students training in partial differential equations, as well as ordinary differential equations and linear algebra, and to reduce the total credit hours.
3. Changes 1 and 2 made it necessary to change the order in which several courses are taken.

**Reasons:**

1. Biological Engineering faculty determined that Biological Engineering students needed better computer programming skills and understanding of both ordinary (MA 26200) and partial (MA 30300) differential equations to prepare them for success in later Biological Engineering classes and their professional careers.

**Biological Engineering: Minimum Degree Requirements; Credit Hours Required for Graduation**

<u>Present</u>	<b>Total Credit Hours</b>	<b>128</b>	<u>Proposed</u>	<b>Total Credit Hours</b>	<b>129</b>
<i>Courses</i>		<i>Credit Hours</i>	<i>Courses</i>		<i>Credit Hours</i>
<b>Mathematics and Basic Sciences</b>			<b>Mathematics and Basic Sciences</b>		
Calculus: MA16500, 16600, 26100, 26500, 26600		<b>18</b>	Calculus: MA16500, 16600, 26100, 26200, 30300		<b>19</b>
*Chemistry: CHM 11500, 11600, 25700 (or 25500 and 255001)		<b>12 - 13</b>	*Chemistry: CHM 11500, 11600, 25700 (or 25500 and 255001)		<b>12 - 13</b>
Physics: PHYS 17200		<b>4</b>	Physics: PHYS 17200		<b>4</b>
			Computer Science: CS 15900		<b>3</b>
<b>Biological and Food Sciences</b>			<b>Biological and Food Sciences</b>		
Biological Sciences or Biotechnology: BIOL 11000 and 221 or IT 22600 with Biological Sciences selective and BIOL 23000 or BIOL 23100		<b>8</b>	Biological Sciences or Biotechnology: BIOL 11000 and 221 or IT 22600 with Biological Sciences selective and BIOL 23000 or BIOL 23100		<b>8</b>
*BCHM 30700 or NUTR 20500 or CNIT 22700 or IT 22700; (option to add BCHM 30900, 1 cr. lab)		<b>2 - 4</b>	*BCHM 30700 or NUTR 20500 or CNIT 22700 or IT 22700; (option to add BCHM 30900, 1 cr. lab)		<b>3 - 4</b>
*Biological Sciences & Science Selectives		<b>3- 6</b>	*Biological Sciences & Science Selectives		<b>3</b>
<b>Engineering Tools and Skills</b>			<b>Engineering Tools and Skills</b>		
ENGR 13100, ENGR 13200, CHE 32000		<b>7</b>	ENGR 13100, ENGR 13200, CHE 32000		<b>7</b>
<b>Professional Development</b>			<b>Professional Development</b>		
ABE 29000, 49000		<b>2</b>	ABE 29000, 49000		<b>2</b>
<b>General Education:</b>			<b>General Education:</b>		
Students must satisfy the requirements of both the College of Engineering's General Education Program and the College of Agriculture's Core. Selections must be chosen from approved lists in accordance with counsel from a faculty advisor. ENGL 10600 and COM 11400 are required, 3 credit hours must be in economics (UCC approved) and 3 must be in the humanities (UCC approved). The remaining credit hours needed to attain the minimum of 24 should be chosen carefully and should also be used to meet College of Agriculture requirements for International Understanding and Multicultural Awareness.		<b>24</b>	Students must satisfy the requirements of both the College of Engineering's General Education Program and the College of Agriculture's Core. Selections must be chosen from approved lists in accordance with counsel from a faculty advisor. ENGL 10600 and COM 11400 are required, 3 credit hours must be in economics (UCC approved) and 3 must be in the humanities (UCC approved). The remaining credit hours needed to attain the minimum of 24 should be chosen carefully and should also be used to meet College of Agriculture requirements for International Understanding and Multicultural Awareness.		<b>24</b>
<b>Core Engineering Courses</b>			<b>Core Engineering Courses</b>		
Thermodynamics and Bioprocessing: ABE 20100, 20200, 30100, 30300		<b>13</b>	Thermodynamics and Bioprocessing: ABE 20100, 20200, 30100, 30300		<b>13</b>
Bioprocessing; Momentum, Heat and Mass Transfer: ABE 30400,30700, 30800		<b>9</b>	Bioprocessing; Momentum, Heat and Mass Transfer: ABE 30400,30700, 30800		<b>9</b>

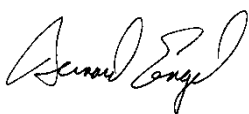
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Kinetics and Reaction Engineering: ABE 37000	3	Kinetics and Reaction Engineering: ABE 37000	3
Sensors and Process Control: ABE 4600007	3	Sensors and Process Control: ABE 460000	3
Transport Processes and Operations: ABE 45700, 55700	6	Transport Processes and Operations: ABE 45700, 55700	6
Biol. and Food Process Design: ABE 55800	3	Biol. and Food Process Design: ABE 55800	3
Process Engineering: ABE 58000	3	Process Engineering: ABE 58000	3
Technical Elective or Design of Electric Systems (ABE 31400)	3	Technical Elective or Design of Electric Systems (ABE 31400)	3

**\*The total number of credit hours in these categories sum to 21.**



Bernard A. Engel  
Professor and Head  
Agricultural and Biological Engineering Department

Date: April 14, 2014

**BE Plan of Study revisions (BIEN major):**

**Present**

**Proposed**

***Freshman Year***

**First Semester**

(4) CHM 11500 General Chemistry I	(4) CHM 11500 General Chemistry I
(4) ENGL 10600 English Composition I	(4) ENGL 10600 English Composition I
(2) ENGR 13100 Transforming Ideas to Innovation I	(2) ENGR 13100 Transforming Ideas to Innovation I
(4) MA 16500 Plane Analytic Geometry and Calculus I	(4) MA 16500 Plane Analytic Geometry and Calculus I
(3) Approved Humanities Selective	(4) PHYS 17200 Modern Mechanics

**17**

**18**

**Second Semester**

(4) CHM 11600 General Chemistry II	(4) CHM 11600 General Chemistry II
(3) COM 11400 Fundamentals of Speech Communications	(3) COM 11400 Fundamentals of Speech Communications
(4) MA 16600 Plane Analytic Geometry and Calculus II	(4) MA 16600 Plane Analytic Geometry and Calculus II
(4) PHYS 17200 Modern Mechanics	(2) ENGR 13200 Transforming Ideas to Innovation II
(2) ENGR 13200 Transforming Ideas to Innovation II	(3) CS 15900 Programming Applications for Engineers

**17**

**16**

***Sophomore Year***

**Third Semester**

(4) ABE 20100 Thermodynamics of Biological Systems I	
(4) MA 26100 Multivariate Calculus	
(4) CHM 25700 Organic Chemistry or Organic Chemistry I 25500 and Organic Chemistry Lab I 25501	
(4/5 BIOL 11000 Fundamentals of Biology I or IT 22600 ) (Biotech. Lab – 2 cr) with 3 cr. BIOL 23000 (Biology of the Living Cell) or BIOL 23100 (Cell Structure & Function)	No Change

(1) ABE 29000 Sophomore Seminar

**17/18**

**17/18**

**Fourth Semester**

(3) ABE 20200 Thermodynamics of Biological Systems II	(3) ABE 20200 Thermodynamics of Biological Systems II
(3) CHE 32000 Statistical Modeling	(3) CHE 32000 Statistical Modeling
(3/4)NUTR 20500 Food Sci. I; or Biochemistry (BCHM / 5) 30700) option to add 1 cr. Lab (BCHM 30900); or take Econ. Selective along with Bioinformatics (CNIT 22700) or Biotech. Lab (IT 22700)	(3/4)NUTR20500 Food Sci. I; or Biochemistry (BCHM / 5) 30700) option to add 1 cr. Lab (BCHM 30900); or take Econ. Selective along with Bioinformatics (CNIT 22700) or Biotech. Lab (IT 22700)
(3) MA 26500 Linear Algebra	(4) MA 26200 Linear Algebra and Differential Equations
(3) MA 26600 Ordinary Differential Equations	(3) Approved Humanities Selective
(3/0 /0) Humanities or Social Science Selective	
<b>16/17/18</b>	<b>16</b>

**Present****Proposed****Junior Year****Fifth Semester**

(3) ABE 30100 Modeling. & Cmptnl. Tools in Bio. Engr.	(3) ABE 37000 Biol./Microb. Kinetics & React. Engr.
(3) ABE 30300 App of Phys. Chemistry to Biol. Processes	(3) ABE 30300 App of Phys. Chemistry to Biol. Processes
(3) ABE 30700 Momentum Transfer	(3) ABE 30700 Momentum Transfer
(4) BIOL 22100 Introduction to Microbiology or 3 cr Biology Selective	(4) BIOL 22100 Introduction to Microbiology or 3 cr Biology Selective
(2) Humanities and Social Sciences Selective	(3) MA 30300 Differential Equations and Partial Differential Equations for Engineering and the Sciences
(1/2) Free Elective (2 cr. if Biol 23000/23100 taken 3 <sup>rd</sup> semester)	
<b>16/17</b>	<b>16</b>

**Sixth Semester**

(3) ABE 37000 Biol./Microb. Kinetics & React. Engr.	(3) ABE 30100 Modeling. & Cmptnl. Tools in Bio. Engr.
(3) ABE 45700 Transport Processes in Biol. & Food Process Systems	(3) ABE 45700 Transport Processes in Biol. & Food Process Systems
(3) ABE 30800 Heat & Mass Tran. in Food & Biol. Sys.	(3) ABE 30800 Heat & Mass Tran. in Food & Biol. Sys.
(3) ABE 30400 Bioprocess Engineering Laboratory	(3) ABE 30400 Bioprocess Engineering Laboratory
(3/6) ABE 31400 Design of Electronic Systems; or Humanities & Social Sci. Sel. (can also add HSS Selective to give 18 hrs.)	(3) ABE 31400 Design of Electronic Systems
	(3) Economics Selective
<b>15/18</b>	<b>18</b>

**Senior Year**

**Seventh Semester**

(3) ABE 55700 Transport Operations in Food & Biol. Engr. II (1) ABE 49000 Professional Practice in Agr.& Biol. Engr. (3) ABE 46000 Sensors and Process Control (3)            Biol., Food Sci. or Pharmacy Selective  (3/4)            Written & Oral Communication Selective (can add 1 cr. free elective from 5 <sup>th</sup> sem.)	(3) ABE 55700 Transport Operations in Food & Biol. Engr. II (1) ABE 49000 Professional Practice in Agr.& Biol. Engr. (3) ABE 46000 Sensors and Process Control (3)            Humanities or Social Sciences or Engineering Selective (3)            Written & Oral Communication Selective
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**13/14**

**13/14**

**Eighth Semester**

(3) ABE 58000 Process Engr. of Renewable Resources (3) ABE 55800 Process Design for Food & Biol. Systems (3/2            Biol., Food Sci., or 2 cr. Pharm. Selective or )            Cell & Molecular Des. Prin. (ABE 440) (3)            Humanities or Social Sciences or Engineering Selective (3)            Humanities or Social Science Selective (300+ level)	(3) ABE 58000 Process Engr. of Renewable Resources (3) ABE 55800 Process Design for Food & Biol. Systems (3)            Biol., Food Sci., or 3 cr. Pharm. Selective or Cell & Molecular Des. Prin. (ABE 440) (3)            Humanities or Social Sciences or Engineering Selective (3)            Humanities or Social Science Selective (300+ level)
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**15/14**

**15**

**Total 128**

**Total 129**