

TO: The Faculty of the Schools of Engineering

FROM: The Faculty of the Agricultural and Biological Engineering

DATE: April 2003

SUBJECT: Change of Course Requirements for the Degree Bachelor of Science in Agricultural and Biological Engineering Option Food Process Engineering

The Faculty of the Department of Agricultural and Biological Engineering has approved course requirements changes, to the curriculum for the Food Process Engineering degree option resulting in no change in the total of 133 credit hours required for the degree. This action is now submitted to the Engineering Faculty with a recommendation for approval.

The proposed changes to the Food Process Engineering plan of study are to more closely reflect the current focus on the processing of biological materials. The new plan of study provides students with a directed choice, depending on their area of interest, between biological and food processing. The expansion of biological courses is designed to provide the students with the necessary background for the fundamental understanding of biological processes.

Current and proposed curricula are attached as well as current and proposed suggested plans of study. Detailed descriptions of proposed changes are provided along with reasons for these proposed changes.

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Head, Department of Agricultural & Biological Engineering

## Current Minimum Degree Requirement for Food Process Engineering

<b>Credit Hours Required for Graduation: 133</b>	
<i>Courses</i>	<i>Credit Hours</i>
<b>Mathematics and Basic Sciences</b>	
Calculus: MA 165, 166, 261, 265, 266	18
Chemistry: CHM 115, 116, 257	12
Physics: PHYS 152, 241	7
Biological Sciences: BIOL 225, 221	8
<b>Food Sciences</b>	
FS 362, 453	7
Elective	3
<b>Computing</b>	
ENGR 106, CS 156	4
<b>Professional Development</b>	
ENGR 100, ABE 490	2
<b>Communication</b>	
English Composition: ENGL 101	3
Speech: COM 114	3
<b>Humanities and Social Sciences</b> (General Education)	
Must be chosen in accordance with the approved general education list and with the help of a faculty advisor. Of the 18 credit hours, 6 must meet School of Agriculture international understanding requirements, 3 must be an additional communication elective, and 3 must be economics.	18
<b>Core Engineering Courses</b>	
Computations: ABE 205	3
Thermodynamics: ABE 210, 310	6
Physical Properties: ABE 305	3
Heat, Mass, and Momentum Transfer: CHE 377, 378	6
Kinetics and Reaction Engineering: CHE 348	3
Sensors and Process Control: ABE 460	3
Transport Processes: ABE 554	4
Unit Operations: ABE 555	4
Plant Design and Economics: ABE 556	4
<b>Technical Electives</b>	12

## Current Suggested Plan of Study for Food Process Engineering

<b>Credit Hours Required for Graduation: 133*</b>			
A general education elective is recommended to be taken in the freshman year.			
<b>Freshman Year</b> , see Freshman Engineering.			
<b>Sophomore Year</b>			
<i>Third Semester</i>		<i>Fourth Semester</i>	
(3)	ABE 205 (Engineering Computations for Biological Systems)	(3)	ABE 210 (Biological applications of Material and Energy Balances)
(4)	BIOL 225 (Biology-the Basic Concepts )	(4)	CHM 257 (Organic Chemistry)
(4)	MA 261 (Multivariate Calculus)	(3)	MA 265 (Linear Algebra)
(3)	PHYS 241 (Electricity and Optics)	(3)	MA 266 (Ordinary Differential Equations)
(3)	General education elective †	(3)	Engineering technical elective
(17)		(16)	
<b>Junior Year</b>			
<i>Fifth Semester</i>		<i>Sixth Semester</i>	
(3)	ABE 305 (Physical Properties of Biological Materials)	(4)	ABE 454 (Transport Processes in Biological and Food Process Systems)
(3)	ABE 310 (Thermodynamics of Food and Biological Systems)	(4)	BIOL 221 (Introduction to Microbiology)
(3)	CHE 377 (Momentum Transfer)	(3)	CHE 348 (Chemical Reaction Engineering)
(4)	FS 453 (Food Chemistry)	(3)	CHE 378 (Heat and Mass Transfer)
(3)	General education elective †	(3)	General education elective †
(16)		(17)	
<b>Senior Year</b>			
<i>Seventh Semester</i>		<i>Eighth Semester</i>	
(1)	ABE 490 (Professional Practice in Agricultural and Biological Engineering)	(3)	ABE 460 (Sensors and Process Control)
(4)	ABE 555 (Biological and Food Processing Unit Operations)	(4)	ABE 556 (Food Plant Design and Economics)
(3)	FS 362 (Food Microbiology)	(3)	Engineering technical elective
(6)	Engineering technical electives	(3)	Food Science elective ‡
(3)	General education elective †	(3)	General education elective
(17)		(16)	
<p>*The total of 133 credits includes MA 265 and 266 instead of MA 262.          †Eighteen credit hours of general education electives must be chosen in accordance with the general education document (available in the Student Academic Center, Room 201, Agricultural and Biological Engineering Building). Of the 18 credit hours, 3 must be economics (ECON 251 or 252), and 3 must be an additional communication elective.          ‡Restricted elective – see approved list, which appears in the ABE Student Handbook.</p>			

## Proposed Minimum Degree Requirements for Food Process Engineering

<b>Credit Hours Required for Graduation: 133</b>	
<i>Courses</i>	<i>Credit Hours</i>
<p><b>Mathematics and Basic Sciences</b></p> <p>Calculus: MA 165, 166, 261, 265, 266</p> <p>Chemistry: CHM 115, 116, 257</p> <p>Physics: PHYS 152, 241</p>	<p>18</p> <p>12</p> <p>7</p>
<p><b>Biological and Food Sciences</b></p> <p>Biological Sciences: BIOL 221, 295E, 295F</p> <p>BCHM 221 or F&amp;N 205</p> <p>Biological or Food Science electives**</p>	<p>8</p> <p>3</p> <p>6</p>
<p><b>Computing</b></p> <p>ENGR 106, CS 156</p>	<p>4</p>
<p><b>Professional Development</b></p> <p>ENGR 100, ABE 490</p>	<p>2</p>
<p><b>Communication</b></p> <p>English Composition: ENGL 106</p> <p>Speech: COM 114</p>	<p>4</p> <p>3</p>
<p><b>Humanities and Social Sciences</b> (General Education)</p> <p>Must be chosen in accordance with the approved general education list and with the help of a faculty advisor. Of the 18 credit hours, 6 must meet School of Agriculture international understanding requirements, 3 must be an additional communication elective, and 3 must be economics.</p>	<p>18</p>
<p><b>Core Engineering Courses</b></p> <p>Computations: ABE 205</p> <p>Thermodynamics: ABE 210, 303, 310</p> <p>Heat, Mass, and Momentum Transfer: CHE 377,378</p> <p>Kinetics and Reaction Engineering: ABE 370</p> <p>Sensors and Process Control: ABE 460</p> <p>Transport Processes: ABE 454</p> <p>Unit Operations: ABE 555</p> <p>Plant Design and Economics: ABE 556</p> <p>Process Engineering ABE 580</p>	<p>3</p> <p>9</p> <p>6</p> <p>3</p> <p>3</p> <p>4</p> <p>4</p> <p>4</p> <p>3</p>
<p><b>Technical Electives**</b></p>	<p>9</p>
<p>† Eighteen credit hours of general education electives must be chosen in accordance with the general education document (available in the Student Academic Center, Room 201, Agricultural and Biological Engineering Building). Of the 18 credit hours, 3 must be economics (ECON 251 or 252) and 3 must be an additional communication elective.</p>	
<p>** Restricted elective – see approved list, which appears in the ABE Student Handbook</p>	

## Proposed Suggested Plan of Study for Food Process Engineering

Credit Hours Required for Graduation: 133

A general education elective is recommended to be taken in the freshman year.

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**Freshman Year**, see Freshman Engineering

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**Sophomore Year**

**Third Semester**

3	ABE	205	Engineering computations for Biological Systems
4	MA	261	Multivariate Calculus
4	CHM	257	Organic Chemistry
3	PHYS	241	Electricity and Optics
3			General Education elective **

17

**Fourth Semester**

3	ABE	210	Biological Applications of Material and Energy Balances
3	BCHM	221	Analytical Biochemistry or F&N 205 Food Science
3	MA	265	Linear Algebra
3	MA	266	Ordinary Differential Equations
3			Engineering Elective
3			General Education Elective **

18

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**Junior Year**

**Fifth Semester**

3	ABE	303	Applications of Physical Chemistry to Biological Processes
3	ABE	310	Thermodynamics of Food and Biological Systems
3	CHE	377	Momentum Transfer
3	Biol	295E	Biology of the Living Cell
1	Biol	295F	Quantitative Biology of the Living Cell
3			General Education elective **

16

**Sixth Semester**

4	BIOL	221	Microbiology
3	ABE	370	Biological/Microbial Kinetics and Reaction Engineering
3	CHE	378	Heat and Mass Transfer
4	ABE	454	Transport Processes in Biological and Food Process Systems
3			Engineering Elective

17

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**Senior Year**

**Seventh Semester**

1	ABE	490	Professional Practice in Agricultural and Biological Eng
4	ABE	555	Biological and Food Process Operations
3			Biological Science Elective or Food Science Elective††
3			Engineering Elective††
6			General Education elective**

17

**Eighth Semester**

3	ABE	580	Process Eng of Renewable Resources
4	ABE	556	Biological and Food Process Design
3	ABE	460	Sensors and Process Control
3			General Education elective**
3			Biological Science Elective or Food Science Elective††

16

\*\* Eighteen credit hours of general education electives must be chosen in accordance with the general education document (available in the Student Academic Center, Room 201, Agricultural and Biological Engineering Building.) Of the 18 credit hours, 3 must be economics (ECON 251 or 252), and 3 must be an additional communication elective.

†† Restricted elective – see approved list, which appears in the ABE Student Handbook.

A. Curricular changes:

The proposed changes to the Food Process Engineering plan of study are to more closely reflect the current focus on the processing of biological materials. The new plan of study provides students with a directed choice, depending on their area of interest, between biological and food processing. The expansion of biological courses is designed to provide the students with the necessary background for the fundamental understanding of biological processes.

1. Change Plan of Study

**Rationale:**

To reflect more closely the current biological processing focus and to provide more flexibility for student area of focus while not diminishing the possibility of a food processing emphasis.

2. Change Required Biology Course

**From: BIOL 225 Biology – The Basic Concepts (4 cr.)**

**To: BIOL 295E Biology of the Living Cell (3 cr.) and  
BIOL 295F Quantitative Biology of the Living Cell (1 cr.)**

**Rationale:**

The Biological Sciences Department no longer offers BIOL 225. BIOL 295E along with BIOL 295F most closely meets the needs of BFPE program.

3. Addition of Required Course

**From: Food Science Elective**

**To: BCHM 221 Analytical Biochemistry (3 cr.) or F&N 205 Food Science (3 cr.)**

**Rationale:**

To give students a directed choice depending on area of interest.

4. Removal Required Food Science Courses

**From: FS 362 Food Microbiology (3 cr.) and FS 453 Food Chemistry (4 cr.)**

**To: Biological Science Elective or Food Science Electives (6 cr.)**

**Rationale:**

To give students the option of pursuing a particular biological area of interest with food science courses offered as recommended electives.

5. Change in Required ABE Course

**From: ABE 305 Properties of Biological Materials (3 cr.)**

**To: ABE 303 Applications of Physical Chemistry to Biological Processes (3 cr.)**

**Rationale:**

To provide students the necessary background to apply basic Physical Chemistry principles to biological processes.

6. Addition of Required ABE Course

**From: Engineering Elective**

**To: ABE 580 Process Engineering of Renewal Resources (3 cr.)**

**Rationale:**

To provide students in the program the necessary background on conversion and purification of natural compounds.