



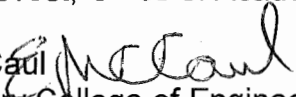
College of Engineering

122 Hitchcock Hall  
2070 Neil Avenue  
Columbus, OH 43210-1278

Phone 614-292-2651  
FAX 614-292-9379  
E-mail engosu@osu.edu

Date: 2 August 2010

To: Randy Smith  
Vice Provost, Office of Academic Affairs

From: Ed McCaul   
Secretary College of Engineering Committee on Academy Affairs (CCAA)


Subject: Semester Conversion Proposal for the BS in Food, Agricultural, and  
Biological Engineering Degree

Attached is a letter from Sudhir Sastry, Department Chair of Food,  
Agricultural, and Biological Engineering, as well as a semester conversion  
proposal for their BS in Food, Agricultural, and Biological Engineering Degree.

This proposal was reviewed by a subcommittee of CCAA. After reviewing  
the proposal and having some changes made to it the subcommittee  
recommended to the full committee that it be approved. After a discussion,  
CCAA unanimously approved the proposal on the 30<sup>th</sup> of July 2010 and  
requested that I forward the proposal to you for consideration by CAA. If you  
have any questions concerning this proposal please let me know.



The Department of Food, Agricultural,  
and Biological Engineering  
590 Woody Hayes Drive  
Columbus, Ohio 43210  
614-292-6131

To: The Office of Academic Affairs (OAA)  
From: Sudhir Sastry, Professor and Interim Chair   
Date: July 16, 2010  
Re: Department of Food, Agricultural, and Biological Engineering (FABE)  
Semester Proposals for Engineering programs

On behalf of the faculty of the Department of Food, Agricultural, and Biological Engineering, I am pleased to submit these semester conversion proposals for our programs that reside academically within the College of Engineering. The department currently administers seven programs; all are being converted to semesters. These include:

- Three undergraduate programs:
  - BS in Food, Agricultural, and Biological Engineering (currently having three formally approved specializations and 12 registrar-designated SIS sub-plans)
  - BS in Construction Systems Management (CSM)
  - Major in Agricultural Systems Management (leading to a BS in Agriculture)
- Two minor programs:
  - Agricultural Systems Management (ASM)
  - Landscape Construction
- Two graduate programs:
  - MS in Food, Agricultural, and Biological Engineering
  - PhD in Food, Agricultural, and Biological Engineering
- One combined program: BS / MS in Food, Agricultural, and Biological Engineering

The department administratively resides in the College of Food, Agricultural, and Environmental Sciences (FAES) with adjunct status in the College of Engineering. Those programs that academically reside within the College of Engineering (BS, MS and PhD in FABE) are part of the university's first wave of planning (to be submitted to OAA in Spring 2010). The programs that reside within the College of Food, Agricultural, and Environmental Sciences (BS in CSM, ASM major, ASM minor, Landscape Construction minor) are part of the university's third wave of planning (to be submitted to OAA in Autumn 2010). Several new programs within the College of Engineering may be proposed at a later date. These include an ecological engineering graduate interdisciplinary specialization and a Masters in International Ecological Engineering. This letter accompanies and introduces proposals for conversion of the existing FABE programs offered through the College of Engineering.

These curricula were developed with thoughtful input from faculty, teaching staff, students, and our departmental industry advisory committees. The FABE faculty was represented on the College of Engineering's Q2S initial 4-person steering committee, which was established in February 2009 to plan and organize the college's semester conversion in anticipation of the University Senate's official vote to convert in June 2009. That group met regularly and was expanded to include representatives from each of the College of Engineering's departments in June 2009.

Over the 2009 summer, a faculty member and a graduate teaching assistant from our department performed a benchmark analysis of curricula. They researched the undergraduate curricula at peer semester institutions (32 biological and/or food engineering programs, 15 agricultural engineering programs, 22 agricultural systems management programs, and 44 construction management programs).

The department's faculty and staff engaged in an all-day retreat on Sept. 18, 2009, to review our "State of the Union" for academic affairs, discuss our current programs' objectives and student learning outcomes, consider the benchmark data, and introduce quarter-to-semester transition issues and planning processes. Following the department's all-day retreat on Sept. 18, 2009, a subcommittee of three faculty members (Drs. Lichtensteiger, Kaletunc, and Christy) was formed to begin the proposal drafting process. A department-wide Carmen site was developed as a way to keep communication open and transparent to all. A series of weekly small working group meetings were convened throughout the 2009-2010 academic year to develop revised program objectives and outcomes and to generate the curricula drafts.

The College of Engineering began holding weekly Q2S Task Force meetings in September 2009. This group engaged in extended conversations with representatives from math, physics, and chemistry to develop memoranda of understanding because decisions made in those units had large ramifications on all engineering curricular decisions. The College of Food, Agricultural, and Environmental Sciences began holding bi-weekly Q2S Implementation Committee meetings in November 2009. Both committees provided opportunities for each department's point persons to present their progress and to work together in subcommittees on topics of mutual interest such as general education, global experience, shared core curricula, graduate education, student services, outcomes assessment, and capstone experience / capstone engineering design.

Three first drafts of the BS in FAFE semester curricula were discussed at the department faculty meeting on November 20, 2009. This served to energize other faculty who had delegated the task to the subcommittee, and precipitated much wider involvement in developing second drafts of the program curricula. There was also strong support for generating a fourth formal specialization (ecological engineering) in the BS in FAFE program. The departmental Q2S subcommittee was expanded to a subcommittee of four (adding Dr. Jay Martin) and continued to hold weekly meetings which were open to all faculty and instructors; typically two to five attended. Because not everyone was able to make these meetings, subcommittee members began meeting individually with other faculty members and staff instructors to get their input and buy-in.

Final recommendations from the subcommittee on the BS in FAFE program objectives, outcomes, four-specialization program structure, and associated curricula were discussed and passed unanimously at the department's regular monthly faculty meeting on Friday, April 9, 2010 (results: 14 faculty present out of 18 total, 13 for, 0 against, 1 abstention by chair). Curricula for the MS and PhD programs, as presented in this proposal, were approved at the May 7, 2010 faculty meeting (results: 16 faculty present out of 18 total, 15 for, 0 against, 1 abstention by chair).

Student input was gathered through one-on-one conversations between department subcommittee members and their advisees, during 2010 senior exit interviews, and by holding two meetings with junior and senior undergraduates on May 26, 2010 where the BS in FAFE proposal was shared and discussed. On that day Dr. Lichtensteiger met with 48 students enrolled in FABENG 525, and Dr. Christy met with 20 students enrolled in FABENG 645. The students were strongly supportive of the increased differentiation between the four specializations, and several advocated heavily for moving toward having four separate degree programs instead of specializations. The selection of specialization-specific science courses was viewed very favorably. There was enthusiastic support for the proposal to teach fluids, thermodynamics, and heat transfer in the department featuring food, agricultural, biological, and ecological applications. The current method of having students take these courses among various offerings from Civil Engineering (for fluids), Mechanical Engineering (for fluids, thermodynamics, and heat transfer), and Chemical Engineering (for fluids, thermodynamics, mass transport, and heat transfer)

was viewed by the students as less than ideal, given the variety of prerequisite knowledge needed for success in each course depending on which department offered the content plus the relative lack of FABE-appropriate application examples. Other comments and suggestions were made on computer programming requirements, internships, junior pre-capstone design, industry involvement, potential May-term offerings, and departmental minors.

The department's Industry and Professional Advisory Group (IPAG) are regularly consulted about program objectives and outcomes and has twice reviewed the proposed semester curricula. At their November 19, 2009 meeting, preliminary materials about the semester conversion were presented. At that meeting it was requested that IPAG create a scorecard for their members to evaluate senior capstone design projects, providing direct assessment by industry representatives of student achievement of program learning outcomes. IPAG member Steve Helmrich suggested a proposal and final project evaluation to gauge progress and for students to submit executive summaries prior to their formal presentations. This feedback process was first implemented at the next IPAG meeting on May 18, 2010. In addition, the faculty-approved versions of revised objectives, outcomes, and the semester program proposal for the four BS in FABE specializations were also shared with IPAG on May 18, 2010. Some minor changes were suggested, but overall the group was very supportive of the proposed new curriculum and related program goals.

Given the widespread support by industry, students, faculty, and staff, I heartily recommend that this proposal for semester-based BS, MS, and PhD programs in FABE be approved.

## BS in Food, Agricultural, and Biological Engineering (BS in FABE) Program Proposal

Primary contact: Ann D. Christy ([Christy.14@osu.edu](mailto:Christy.14@osu.edu), 292-3171)  
Secondary contact: Gonul Kaletunc ([kaletunc.1@osu.edu](mailto:kaletunc.1@osu.edu), 292-0419)

### GENERAL PROGRAM INFORMATION

**Fiscal Unit / Academic Organization:** D1123: Food, Agricultural, and Biological Engineering

**Administering College / Academic Group:** Engineering

**Co-administering College / Academic Group:** Food, Agricultural, and Environmental Sciences

**Semester conversion designation:**

Re-envisioned with changes to program goals and curricular requirements (*This proposal includes changes in program goals by adding specialization-specific goals, changes in core requirements by developing three "Fundamentals of FABE" courses, and structural changes to specializations by defining four specializations from what previously were three approved sub-plans.*)

**Program / Plan name:** Food, Agricultural & Biological Engineering

**Type of Program / Plan:** Undergraduate bachelors degree program

**Program / Plan SIS code abbreviation:** FABE-BS

**Degree Title:** Bachelor of Science in Food, Agricultural & Biological Engineering

**Specializations / Sub-plan names** (to be printed on the students' transcripts) **and SIS codes:**

1. Food Engineering (FDE)
2. Agricultural Engineering (AEM: *Note: This combines previous quarter-based codes AEM, AEW and AEF*)
3. Biological Engineering (BEB: *Note: This combines previous quarter-based codes BEB, BED, BEH, BEM, BEO and BEV*)
4. Ecological Engineering (BEC: *Note: This combines previous quarter-based codes BEC and BEN*)

### PROGRAM REQUIREMENTS

**Program learning goals:** In keeping with the terminology used by the FABE program's accrediting body (ABET Inc., see [www.abet.org](http://www.abet.org)), program goals are separated into objectives and outcomes. Objectives describe the future accomplishments and attributes of our graduates who are 2 to 5 years or more into their careers. Outcomes, on the other hand, are the knowledge, skills, and attitudes / perspectives to be attained by our students at the time of successful completion of the BS in FABE program.

ABET publishes program criteria for all engineering disciplines, and the BS in FABE program falls under two of those named ABET programs: “Agricultural and similarly named programs” and “Biological and similarly named programs.” The first eleven outcomes listed below (a-k) are common to all engineering programs, as stated by our accreditation board, with additional ones (l-m) which are specific to the Agricultural Engineering specialization and (l-n) which are specific to the Food, Biological, and Ecological Engineering specializations (all three of which are accredited under the Biological and Similarly Named” engineering criteria).

*The program educational objective of the B.S. in Food, Agricultural and Biological Engineering degree program is to produce alumni who are:*

1. Professionals, using their technical skills within the engineering profession and/or other related professional activities which may include advanced degrees in engineering, business, law, veterinary or human medicine.
2. Creative problem solvers, applying fundamental principles of mathematics, science, and engineering to address challenges and opportunities in food, agricultural, biological, and/or ecological systems.
3. Design engineers, working in teams and individually, to design components, processes and systems for applications in one or more of the specializations in food, agricultural, biological, and/or ecological engineering.
4. Effective team members and leaders, applying skills in project management, written communications and oral presentation.
5. Socially responsible engineers, upholding ethical principles, staying up-to-date professionally, and serving as effective members of their communities.

*The program outcomes of the BS in Food, Agricultural, and Biological Engineering program are that students will attain the following outcomes by the time of their graduation:*

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Program specialization / sub-plan learning goals:**

*The additional program outcomes of the four specializations are that students will demonstrate:*

***Agricultural Engineering***

- (l) competence in applying engineering sciences to real world problems in agriculture or natural resources
- (m) working knowledge of an applied biological or agricultural science (e.g., agronomy, animal science, crop science, entomology, horticulture, soil science).

***Food Engineering***

- (l) competence in applying engineering sciences to the design and optimization of food and bio- processing systems
- (m) thorough grounding in biology and chemistry
- (n) working knowledge of advanced food sciences (e.g., food microbiology, food chemistry).

***Biological Engineering***

- (l) competence in applying engineering sciences to real world problems involving biological systems
- (m) thorough grounding in biology and chemistry
- (n) working knowledge of advanced biological sciences (e.g., microbiology, molecular genetics, biochemistry).

***Ecological Engineering***

- (l) competence in applying engineering sciences to real world problems in ecological systems
- (m) thorough grounding in biology and chemistry
- (n) working knowledge of advanced ecological sciences (e.g., ecology, wetlands sciences, natural resources).

List of Semester Courses:

<b>General Education</b> (excluding math and natural science)	<b>Course Number</b>	<b>Cr-Hrs</b>
First-year English Composition	English 1110	3
Writing for Engineers	Engineer 2367	3
Literature	<i>varies</i>	3
Arts	<i>varies</i>	3
Historical Study	<i>varies</i>	3
Social Science 1	<i>varies</i>	3
Social Science 2	<i>varies</i>	3
Culture and Ideas: Ethics	<i>varies</i>	3
<b>Subtotal: Non-Double Counted General Education Hours</b>		<b>24</b>
<b>Engineering Core</b> (required of all engineering programs)		
Engineering Orientation / Survey	Engineer 1100.01, 1100.02	1
Introduction to Engineering - I	Engineer 1181	2
Introduction to Engineering - II	Engineer 1182	2
Engineering Calculus - I	Math 1151	5
Engineering Calculus - II	Math 1152	5
Physics I	Physics 1131	5
<b>Subtotal: Engineering Core Hours</b>		<b>20</b>
<b>BS in FABE Core</b> (Required of all FABE specializations)		
<b>Required courses offered outside of unit</b>		
Engineering Math III (Multivariate Calculus & Differential Equations)	Math 2xxx	4
Physics II	Physics 1132	5
Introduction to Computer Programming in MATLAB for Engineers and Scientists	CSE 1221 or Engineer 1221	2
Computer Graphics Using AutoCAD (or Solid Works)	Engineer 4410.01 (or 4410.02)	2
Engineering Economics	ISE 2040	2
<b>Subtotal</b>		<b>15</b>
<b>Required courses offered by the unit</b>		
Fundamentals of FABE – I (mass & energy balances, fluid mechanics)	FABE 2110	4
Fundamentals of FABE – II (engineering statistics, thermodynamics)	FABE 2120	4
Fundamentals of FABE – III (heat transfer, mass transport)	FABE 3130	4
Professional Development in FABE	FABE 3140	1
System Dynamics and Electricity	FABE 3150	4
Electronics, Measurement, and Instrumentation	FABE 5160	4
Senior Exit Survey	FABE 4170	0
Capstone Design -I	FABE 4900	3
Capstone Design -II	FABE 4910	3
<b>Subtotal</b>		<b>27</b>
<b>Total requirements common to all FABE specializations</b>		<b>86</b>



<b><u>Food Engineering Specialization Requirements</u></b>		
Quantitative Biology	Biology 1xxx	3
General Chemistry - I	Chem 1121	5
General Chemistry - II	Chem 1122	5
Organic Chemistry	Chem 2xxx	4
Physical Chemistry	Chem xxxx	4
Basic Microbiology	Microbiol xxxx	4
Food Microbiology	Food Sci &Tech 5530	2
Kinetics & Reactor Design	ChBE 3610	4
Unit Operations in Food Engineering	FABE 4410	3
Advanced Food Engineering	FABE 5410	3
Technical Electives (any engineering or food science course, level 3000 +)	3 or 4 courses	9
<b>Subtotal for Food Eng-specific requirements:</b>		<b>46</b>
<b>Total required for completion of program</b>		<b>132</b>
<b><u>Agricultural Engineering Specialization Requirements</u></b>		
Chemistry for Engineers	Chem 1xxx	4
Applied Biological or Agricultural Science elective	1 course	4
Statics	MechEng 2010	2
Mechanics of Materials	MechEng 2020	3
Dynamics	MechEng 2030	3
Surveying in FABE	FABE 2710	2
Soil and Water Engineering	FABE 2720	3
Power and Hydraulics in FABE	FABE 3610	3
Structures in FABE	FABE 3810	3
Heating, Ventilation, and Air Conditioning (HVAC) in FABE	FABE 5820	3
Water Table Management Engineering or Irrigation Systems Engineering	FABE 5730 or FABE 5740	2
Technical Electives (any engineering course, level 3000 +)	5 or 6 courses	14
<b>Subtotal for Ag Eng-specific requirements:</b>		<b>46</b>
<b>Total required for completion of program</b>		<b>132</b>

<b><u>Biological Engineering Specialization Requirements</u></b>		
Quantitative Biology	Biology 1xxx	3
General Chemistry - I	Chem 1xxx	5
General Chemistry - II	Chem 1xxx	5
Organic Chemistry - I	Chem 2xxx	4
Advanced Biology (e.g., microbiology, anatomy, physiology, molecular genetics, nutrition) or Soil and Water Engineering Note: may substitute Organic Chemistry – II and/or Biochemistry for 2 of the courses	3 courses	10
Project Management	ISE 3800	2
Statics and Intro to Mechanics of Materials	MechEng 2040	4
Biological Engineering	FABE 3510	4
Technical Electives (any engineering course, level 3000 +)	3 courses	9
<b>Subtotal for Biological Eng-specific requirements:</b>		<b>46</b>
<b>Total required for completion of program</b>		<b>132</b>
<b><u>Ecological Engineering Specialization Requirements</u></b>		
Quantitative Biology	Biology 1xxx	3
Chemistry for Engineers	Chem 1xxx	4
Organic Chemistry Survey	Chem 2x	4
Ecology - I	EEOB xxxx	3
Ecology - II	EEOB xxxx	3
Engineering Project Management	ISE 3800	2
Statics and Intro to Mechanics of Materials	MechEng 2040	4
Surveying in FABE	FABE 2710	2
Soil and Water Engineering	FABE 2720	3
Ecological Science and Engineering	FABE 5310	3
Design of Sustainable Waste Management Systems	FABE 5550	3
Watershed Hydrology & Stream Morphology	FABE 5750	3
Technical Electives (any advanced ecology [ENR or EEOB] or engineering course, level 3000 +)	3 or 4 courses	9
<b>Subtotal for Ecological Eng-specific requirements:</b>		<b>46</b>
<b>Total required for completion of program</b>		<b>132</b>

## Program Rationale

The proposed BS in FABE has been re-envisioned with a number of enhancements, based on assessment results and ongoing feedback about the current program. The most important features are:

**Revised program objectives.** The previous objectives do not meet the current standard of engineering's accrediting body, ABET. Their 2009-2010 Criteria define program educational objectives as "broad statements that describe the career and professional accomplishments that the program is preparing students to achieve" ([www.abet.org](http://www.abet.org)). Specifically, programs at other institutions are being given "Weakness" ratings for not explicitly reflecting intended accomplishments of alumni several years past graduation. While this was the main rationale for change, the opportunity also allowed faculty, staff, and the department's Industry and Professional Advisory Group (IPAG) to further refine and update the objectives.

**Revised program outcomes.** The program's previous student learning objectives were taken directly from ABET's general criteria for all engineering programs, regardless of discipline. It was determined by the faculty that this did not sufficiently address the unique skills required by the FABE profession. The decision was made to retain the original common 11 outcomes but add two or three more depending on the specialization within FABE. ABET's 2009-2010 Program Criteria for **Agricultural and similarly named programs** state that "Programs must demonstrate that graduates have proficiency in ... biological and engineering sciences..." ABET's 2009-2010 Program Criteria for **Biological and similarly named programs** state that "Programs must demonstrate that graduates have ... a thorough grounding in chemistry and biology and a working knowledge of advanced biological sciences..." The proposed outcomes reflect these new requirements and apply them to the specific professional domains of the four specializations.

**Four-specialization program structure.** Increased industry recognition, employment opportunities, and student demand for the emerging ecological engineering discipline led to the development of a fourth formal specialization within the BS in FABE program. This had existed previously as an informal selection of technical electives within the Biological Engineering specialization under quarters. The four proposed semester specializations (Food, Agricultural, Biological, and Ecological Engineering) hold 86 semester credit hours in common. Differentiation in supporting sciences and applied engineering requirements is provided in the 46 credit hours unique to each of the four specializations. This allows the BS in FABE program to draw upon its historic strength of being one of the most general forms of engineering, while also allowing undergraduates to develop areas of expertise within one of four recognized areas.

**"Fundamentals of FABE" sophomore and junior course sequence.** Students currently entering the BS in FABE take a series of courses both within and outside of the department to establish competency in basic engineering topics including mass and energy balances, applied statistics, numerical methods, fluid mechanics, thermodynamics, heat transfer, and mass transport. The current method is for students to take three to five of these courses among various offerings from Civil Engineering (for fluids), Mechanical Engineering (for fluids, thermodynamics, and heat transfer), and Chemical Engineering (for fluids, thermodynamics, mass transport, and heat transfer). Although waivers of prerequisites are commonly given, the variety of prerequisite knowledge needed for success in each course varied depending on which department offered the content. Students often took only the first in a series of courses on the topic (e.g., fluids, thermodynamics) and thus missed important material in the follow-on courses required by the host department for their own majors. This, plus the relative lack of FABE-appropriate application examples, made this time of semester conversion an attractive opportunity to better integrate and offer these

fundamental engineering topics within the department as a three-course sequence to be taken by all of our undergraduates regardless of their specialization areas.

**Expanded capstone design experience.** The year-long senior capstone design course sequence (currently three 2- quarter credit hour courses) is being converted to two 3-semester credit hour courses, a one-third expansion in equivalent credit hours. This will allow students to be more fully immersed in a propose-design-build-test-redesign project with an industry client. The current sequence is largely viewed by faculty and students to have too few credits for the amount of work performed by students and course instructors.

**Structured course numbering system.** Given the Office of the Registrar's new four-digit course numbering requirements under the semester system, a common numbering scheme was developed for FABE courses where the first digit, X, is the rank of the course's primary audience (1 for freshmen, 2 for sophomores, etc.) and the third and fourth digits, xx, form the number indicating sequential progression within a given topic area. Topic areas are designated by the second digit as shown below:

- X1xx = Required FABE courses on topics common across all undergraduate specializations
- X2xx = Required FABE courses on topics common across all graduate specializations
- X3xx = Ecological engineering
- X4xx = Food engineering
- X5xx = Biological engineering
- X6xx = Agricultural power and machinery
- X7xx = Agricultural soil and water
- X8xx = Agricultural structures and facilities

**General Education and Engineering Core courses.** These courses are common across the College of Engineering. Please refer to the College of Engineering's Quarter to Semester Conversion Proposal for discussion of the rationale for changes to those parts of the program.

**Date of last significant program revision.** The last significant program revision was the 2007 revision of the GEC. The previous significant program revision was driven by the Engineering Core revision that went into effect in 2000.

**Quarters (Current) Advising Sheets** (Note: There follow only three quarters-based advising sheets because the Ecological Engineering specialization is currently a sub-specialization within Biological Engineering):

Food, Agricultural and Biological Engineering – Food Engineering Option  
2009-2010

Official Version

Name: \_\_\_\_\_

E-mail: \_\_\_\_\_

@osu.edu

Phone: \_\_\_\_\_

New to OSU: \_\_\_\_\_

YEAR	AUTUMN	WINTER	SPRING
1	Chem 121 (Gen Chem).....5 Engr 181 (Intro to Engr I).....5 Math 151.OX (Calc & Analyc Geom).....5 Engr 100.08 (Engr Survey).....1	Chem 125 (Chem for Engr).....4 Engr 183 (Intro to Engr II).....3 Math 152.OX (Calc & Analyc Geom).....5 Physics 131 (Particls & Motion).....5	EnGraph 167 (Prob Siv Prog Engr) or CSE 202 (Prog Algro Engr & Sci)....4 Math 153.OX (Calc & Analyc Geom).....5 Physics 132 (Electrcy & Magntsm).....5
2	FABE 225 (Intro to FABE).....3 Math 254.OX (Calc & Analyc Geom).....5 ME 410 (Statics).....4 Physics 133 (Electrdynmc & Quant).....5	Biology 113 (Energy Trans & Devl).....5 FABE 325 (Trans in FAB Sys).....3 Math 415.OX (Ord Part Diff Equal).....4 *ME 430 (Dynamics).....4	ChBE 420 (ChBE Trans Phenmn).....4 *EnGraph 410A (Computer Graph).....3 Microbiology 509 (Bacs& Prac Micro).....5
3	ChBE 521 (Transport Phenmn).....3 *ME 501 (Thermodynamics).....4	ChBE 522 (Transport Phenmn II).....3 FABE 425 (Anlys Elem Bio-Phys Sys).....4 ISE 504 (Engr Econ Analysis).....3	^^Chem 231 or 251 (Orgnc Chem).....3 FABE 525 (Elec Pwr Sys for Agr).....4 *FST 636.01 (Food Microbiology).....3 FST 636.02 (Food Microbio Lab).....2 <sup>A</sup>
4	FABE 625 (Mdl & Dsgn Biol Sys).....4 FABE 695 (Prof Development).....1 FABE 723 (Capstone Dsgn I).....2 FST 601 (Food Analysis).....5	FABE 584 (Food Process Engr).....4 FABE 724 (Capstone Dsgn II).....2	FABE 725 (Capstone Dsgn III).....2 FABE 683 (Food Process Automt).....4

**Courses printed in BOLD** taught one quarter/year. Check Course Bulletin On-line for availability of other courses.

GENERAL EDUCATION (35 hrs)

TECHNICAL ELECTIVES (15 hrs; min. 6 hrs.  
must be from engineering)

HOURS REQUIRED

English & Communication Skills (10)  
English 110.xx (5)  
(367.) (5)

**^FST 636.02** (1)  
( )  
( )  
( )  
( )  
( )  
( )  
Total: \_\_\_\_\_

Sub-total Core .....145  
General Education.....35  
Technical Electives.....15  
**TOTAL required hours: 195**

**A total of 25 hours (or 5 courses) must be taken between History, Arts & Humanities, and Social Sciences**

History Survey (5-10)  
( )  
( )  
Arts and Humanities (5-10)  
( )  
( )  
Social Sciences (5-10)  
( )  
( )

Ethics (5) (May overlap with A&H or Soc Science) ( )  
Social Diversity (May overlap another GEC) ( )  
Admissions Condition(s) (if applicable) ( )

\* Automatic Substitutions for:  
Eng Graph 410 A = En Graph 410  
ME 430 = ChBE 610  
ME 501 = ChBE 508 + 509  
^FST 636.02 = 3 credit hours, credits are split between core and technical electives  
^^Pre-Health students must take Chem 251 series

Acceptance into the Food, Agricultural and Biological Engineering major will depend upon the cumulative point-hour ratio (CPHR) and the secondary point-hour ratio (SPHR) at completion of the following pre-major courses: *Math 151.OX, 152.OX (or alternatives); Physics 131; Chemistry 121, and Engineering 181 & 183.* A minimum SPHR of 2.0 is required. Students with a CPHR of 3.0 are assured acceptance. Currently there is no limit to the number of students accepted annually. See the departmental Academic Program Coordinator in 212 AE for application details.

**Food, Agricultural and Biological Engineering -- Agricultural Engineering Option**

2009-2010

Name: \_\_\_\_\_

E-mail: \_\_\_\_\_@osu.edu

Phone: \_\_\_\_\_

New to OSU: (Qtr) \_\_\_\_\_ (Yr) \_\_\_\_\_

YEAR	AUTUMN	WINTER	SPRING
1	Chem 121 (Gen Chem).....5 Engr 181.01 (Intro to Engr I).....3 Math 151.0X (Calc & Analy Geom).....5 Engr 100.08.....Engr Survey).....1	Chem 125 (Chem for Engr).....4 Engr 183.0X (Intro to Engr II).....3 Math 152.0X (Calc & Analy Geom)..... 5 Physics 131 (Partcls & Motlon)..... 5	EnGraph 167 (Prob Slv Prog Engr) or CIS 202 (Prog Algro Engr & Soc).....4 Math 153.0X (Calc & Analy Geom).....5 Physics 132 (Electrcy & Magnetsm)..... 5
2	<b>FABE 225</b> (Intro to FABE).....3 Math 254.0X (Calc & Analy Geom).....5 ME 410 (Statics).....4 Physics 133 (Eldynmc & Quant).....5	<b>FABE 325</b> (Trans in FAB Systs).....3 Math 415.0X (Ord Part Dif Equal).....4 ME 430 (Dynamics).....4	*EnGraph 410A (Computer Graph).....3 <b>FABE 373</b> (Soil & Water Engr).....3 ME 420 (Intro Strength Materials).....4
3	<b>CE 413</b> (Fluid Mechanics).....4 <b>FABE 545</b> (Agr Structures).....4	<b>FABE 425</b> (Anlys Elem Bio-Phys Sys).....4 ISE 504 (Engr Econ Analysis).....3 ME 501 (Thermodynamics).....4	<b>FABE 525</b> (Elec Pwr Sys for Agr).....4 <b>FABE 565</b> (Utiliz of Engr in Agr).....4 ME 510 (Heat Transfer).....3
4	<b>FABE 605</b> (Measure & Instrumnt).....4 <b>FABE 625</b> (Mdl & Dsgn Biol Sys).....4 <b>FABE 695</b> (Prof Development).....1 <b>FABE 723</b> (Capstone Dsgn I).....2	<b>FABE 724</b> (Capstone Dsgn II).....2	<b>FABE 645</b> (Envr Cntr for Agr Struct).....4 <b>FABE 673</b> (Dsgn Agr Wtr Mngt Sys).....4 <b>FABE 725</b> (Capstone Dsgn III)..... 2

Courses printed in **BOLD** taught **one quarter/year**. Check Course Bulletin On-line for availability of other courses.

<p>GENERAL EDUCATION (35 hrs)</p> <p>English &amp; Communication Skills (10)</p> <p>English 110.0X ( 5 ) _____</p> <p>( 367. ) ( 5 ) _____</p> <div style="border: 1px solid black; padding: 2px;"> <p><b>A total of 25 hours (or 5 courses) must be taken between History, Arts &amp; Humanities, and Social Sciences</b></p> </div> <p>History Survey (5-10)</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>Arts and Humanities (5-10)</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>Social Sciences (5-10)</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p>	<p>TECHNICAL ELECTIVES (24 hrs; exceeding 7 hrs. of non-eng courses requires approval)</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>_____ ( ) _____</p> <p>Ethics (5) (May replace one A&amp;H or Soc Science)</p> <p>_____ ( ) _____</p> <p>Social Diversity (May overlap another GEC)</p> <p>_____ ( ) _____</p> <p>Admissions Condition(s) (if applicable)</p> <p>_____ ( ) _____</p> <p style="text-align: right;">Total: _____</p>	<p>HOURS REQUIRED</p> <p>Sub-total Core.....136</p> <p>General Education..... 35</p> <p>Technical Electives..... 24</p> <div style="border: 1px solid black; padding: 2px;"> <p><b>TOTAL required hours: 195</b></p> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 10px;"> <p>* Preferred, but EnGraph 410 accepted **Substitutes available – see advisor</p> </div>
--	--	--

Acceptance into the Food, Agricultural and Biological Engineering major will depend upon the cumulative point-hour ratio (CPHR) and the secondary point-hour ratio (SPHR) at completion of the following pre-major courses: *Math 151.0X, 152.0X (or alternatives); Physics 131; Chemistry 121, and Engineering 181.01 & 183.0X*. A minimum SPHR of 2.0 is required. Students with a CPHR of 3.0 are assured acceptance. Currently there is no limit to the number of students accepted annually. See the departmental Academic Program Coordinator in 212 AE for application details.

**Food, Agricultural and Biological Engineering – Biological Engineering Option**  
2008-2009 (including: Ecological, Bio-environmental, Biological, Pre-Vet and Pre-Med options)

Name: \_\_\_\_\_ Student ID: \_\_\_\_\_ Phone: \_\_\_\_\_  
New to OSU: \_\_\_\_\_ E-mail: \_\_\_\_\_@osu.edu

YEAR	AUTUMN	WINTER	SPRING
1	Chem 121 (Gen Chem).....5 Engr 181 (Intro to Engr I).....3 Math 151 (Calc & Analyc Geom).....5 Engr 100.08 (Engr Survey).....1	Chem 125 (Chem. for Engr).....4 Engr 183 (Intro to Engr II).....3 Math 152 (Calc & Analyc Geom).....5 Physics 131 (Partcls & Motion).....5	Biology 113 (Energy Trans & Devt).....5 EnGraph 167 (Prob Siv Prog Engr) or CIS 202 (Prog Algro Engr & Sci).....4 Math 153 (Calc & Analyc Geom).....5 Physics 132 (Electrcy & Magnetsm).....5
2	Biology 114(Form.Fnct, Divst Ecol).....5 FABE 225 (Intro to FABE).....3 Math 254 (Calc & Analyc Geom).....5 ME 410 (Statics).....4	FABE 325 (Trans in FAB Sys).....3 Math 415 (Ord Part Dif Equal).....4 ME 430 (Dynamics).....4	^Chem 231 or 251 (Organic Chem).....3 **EnGraph 410A (Comp Graph).....3 FABE 373 (Soil & Water Engr).....3 Physics 133 (for Bio Engrs).....5 or (Ecol Engrs take)EEOB 503.01.....4
3	^^Biochem 511 (Intro to BioChem).....5 CE 413 (Fluid Mechanics).....4 FABE 545 (Agr Structures).....4	FABE 425 (Anlys Elem Bio-Phys Sys).....4 ISE 504 (Engr Econ Analysis).....3 ME 501 (Thermodynamics).....4	FABE 525 (Elec Pwr Sys for Agr).....4 FABE 650 (Dsgn Wast Mngmt Sys).....4 ME 510 (Heat Transfer).....3
4	+FABE 773(Engr Soil-Wtr Mgl).....4 FABE 605 (Measure & Instrument).....4 FABE 625 (Mdl & Dsgn Biol Sys).....4 FABE 695 (Prof Develop).....1 FABE 723 (Capslne Design I).....2	OR.....FABE 645 (See Spring)..... FABE 724 (Capstone Dsgn II).....2	+FABE 645 (Env Cntr for Agr Struct).....4 FABE 725 (Capstone Dsgn III).....2

**Courses printed in BOLD are taught one quarter per year.**

**Please check On-line Course Offerings for availability of other courses.**

GENERAL EDUCATION (35 hrs)

TECHNICAL ELECTIVES: Biol: 14 hrs.

HOURS REQUIRED

English & Communication Skills (10)

Ecol: 15 hrs.

Sub-total Core .....Biol...146

English 110.xx ( 5 ) \_\_\_\_\_  
( 367. ) ( 5 ) \_\_\_\_\_

( ) \_\_\_\_\_

.....Ecol...145

( ) \_\_\_\_\_

Technical Elective.....Biol...14

( ) \_\_\_\_\_

.....Ecol...15

( ) \_\_\_\_\_

General Education.....35

( ) \_\_\_\_\_

**TOTAL required hours: 195**

( ) \_\_\_\_\_

( ) \_\_\_\_\_

Total

**A total of 25 hours (or 5 courses) must be taken between History, Arts & Humanities, and Social Sciences**

History Survey (5-10)

( ) \_\_\_\_\_

( ) \_\_\_\_\_

Ethics (5) (May overlap with A&H or Soc Science)

( ) \_\_\_\_\_

Arts and Humanities (5-10)

( ) \_\_\_\_\_

( ) \_\_\_\_\_

Social Diversity (May overlap another GEC)

( ) \_\_\_\_\_

Social Sciences (5-10)

( ) \_\_\_\_\_

( ) \_\_\_\_\_

Admissions Condition(s) (if applicable)

( ) \_\_\_\_\_

^ Chem 251 recommended only for students in pre-Health options

^^Substitutes available – see advisor

+ Students may choose either FABE 645 or FABE 773t

\* Ecological Engineering students must take EEOB 503.01(Intro to Ecology)

\*\* Preferred, but EnGraph 410 accepted

Acceptance into the Food, Agricultural and Biological Engineering major will depend upon the cumulative point-hour ratio (CPHR) and the secondary point-hour ratio (SPHR) at completion of the following pre-major courses: *Math 151, 152; Physics 131; Chemistry 121, and Engineering 181 & 183*. A minimum SPHR of 2.0 is required. Students with a CPHR of 3.0 are assured acceptance. Currently there is no limit to the number of students accepted annually. See the departmental Academic Program Coordinator in 213 AE for application details.

Rev. 06/23/08

**Semesters (Proposed) Advising Sheets and Curricular Map – see next pages**

**FOOD ENGINEERING Specialization, BS in Food, Agricultural, and Biological Engineering**

Academic Year 12-13

Suggested GUIDE only. Semesters of offerings subject to change.

PROPOSED

Name: \_\_\_\_\_ Student ID# \_\_\_\_\_ E-Mail: \_\_\_\_\_ @osu.edu \_\_\_\_\_

Bolded courses offered once/year.

<sup>1</sup>Alternative (alt.) courses noted below & Gen Ed courses listed on back

Year	Autumn Semester	Spring Semester	Yr.
1 <sup>st</sup>	Biology 1*** Quantitative Biology 3 _____	Chemistry 1122 General Chemistry II 5 _____	33
	Chemistry 1121 General Chemistry I 5 _____	Engineer 1100.02 Engineering Survey II 0.5 _____	
	Engineer 1100.01 Engineering Survey I 0.5 _____	Engineer 1182 Intro to Engineering II 2 _____	
	Engineer 1181 Intro to Engineering I 2 _____	Math 1152 Engineering Calculus II 5 _____	
	Math 1151 Engineering Calculus I 5 _____	Physics 1131 Physics I 5 _____	
	<b>Target: 15.5</b>	<b>Target: 17.5</b>	
2 <sup>nd</sup>	English 1110 First-year English Composition 3 _____	Chem **** Organic Chemistry 4 _____	33
	<b>FABE 2110 Fundamentals of FABE I</b> 4 _____	CSE 1221 or Engineer 1221 Computer Programming 2 _____	
	Math 2*** Multivar. Calc. & Diff. Eqns. 4 _____	<b>FABE 2120 Fundamentals of FABE II</b> 4 _____	
	Physics 1132 Physics II 5 _____	Microbiol **** Basic Microbiology 4 _____	
	<b>Target: 16.0</b>	<b>Target: 17.0</b>	
3 <sup>rd</sup>	Chemistry **** Physical chemistry 4 _____	<b>FABE 3140 Professional Development</b> 1 _____	34
	Engineer 2367 Writing for Engineers 3 _____	<b>FABE 3150 System Dynamics &amp; Electricity</b> 4 _____	
	Engineer 4410 Computer Graphics 2 _____	<b>FABE 4410 Unit Operations in Food Engineering</b> 3 _____	
	<b>FABE 3130 Fundamentals of FABE III</b> 4 _____	ISE 2040 Engineering Economics 2 _____	
	Food Sci. & Techn. 5530 Food Microbiology 2 _____	<i>General Education course</i> 3 _____	
	<b>Target: 18.0</b>	<b>Target: 16.0</b>	
4 <sup>th</sup>	<b>FABE 4900 Capstone design I</b> 3 _____	ChBE 3610 Kinetics & Reactor Design 4 _____	32
	<b>FABE 5160 Electronics, Measurement, &amp; Instrumentation</b> 4 _____	<b>FABE 4170 Senior Exit Survey</b> 0 _____	
	<i>General Education course</i> 3 _____	<b>FABE 4910 Capstone design II</b> 3 _____	
	<i>General Education course</i> 3 _____	<b>FABE 5410 Advanced Food Engineering</b> 3 _____	
	<i>Technical Elective</i> 3 _____	<i>General Education course</i> 3 _____	
	<b>Target: 16.0</b>	<b>Target: 16.0</b>	

**Technical Electives: 9 hours**  
(any engineering or food science course, level 3000 +)

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

Tech. Elects Total:

**General Education Requirements: 24 hours**

<p><b>Foundations:</b></p> <p>English 1110 3 _____</p> <p>Second Writing Course _____</p> <p>Engineering 2367 3 _____</p> <p><b>Arts and Humanities:<sup>2</sup></b></p> <p>History: _____ 3 _____</p> <p>Literature: _____ 3 _____</p> <p>Arts Elective: _____ 3 _____</p> <p><b>Social Science:<sup>2</sup></b></p> <p>1st Course: _____ 3 _____</p> <p>2nd Course: _____ 3 _____</p>	<p><b>Other GEs</b></p> <p>Culture &amp; Ideas: Ethics _____ 3 _____</p> <p>1st Global Studies Course: _____ 0 _____</p> <p>2nd Global Studies Course: _____ 0 _____</p>
---	--

**General Education Total:**

<sup>1</sup> Alt. for Honors: Engineering 1191 & 1192 replace Engineering 1181, 1182, and Computer Programming	<table style="width: 100%;"> <tr> <td>Required Engineering Courses (ABET 48):</td> <td style="text-align: right;">48</td> </tr> <tr> <td>Math and Science Courses (ABET 32):</td> <td style="text-align: right;">51</td> </tr> <tr> <td>General Education:</td> <td style="text-align: right;">24</td> </tr> <tr> <td>Technical Electives:</td> <td style="text-align: right;">9</td> </tr> <tr> <td><b>Minimum Required to Graduate:</b></td> <td style="text-align: right;"><b>132</b></td> </tr> <tr> <td><b>Total Earned:</b></td> <td style="text-align: right;"><input style="width: 50px;" type="text"/></td> </tr> </table>	Required Engineering Courses (ABET 48):	48	Math and Science Courses (ABET 32):	51	General Education:	24	Technical Electives:	9	<b>Minimum Required to Graduate:</b>	<b>132</b>	<b>Total Earned:</b>	<input style="width: 50px;" type="text"/>
Required Engineering Courses (ABET 48):	48												
Math and Science Courses (ABET 32):	51												
General Education:	24												
Technical Electives:	9												
<b>Minimum Required to Graduate:</b>	<b>132</b>												
<b>Total Earned:</b>	<input style="width: 50px;" type="text"/>												
<sup>2</sup> Global Studies Requirement: All students must complete two GE Global Studies courses. Select two classes in the Arts and Humanities or Social Science categories that can also meet this requirement in order to avoid taking extra courses.													



**AGRICULTURAL ENGINEERING Specialization, BS in Food, Agricultural, and Biological Engineering**

Academic Year 12-13

Suggested GUIDE only. Semesters of offerings subject to change.

PROPOSED

Name: \_\_\_\_\_ Student ID# \_\_\_\_\_ E-Mail: \_\_\_\_\_ @osu.edu

Bolded courses offered once/year.

**<sup>1</sup>Alternative (alt.) courses noted below & Gen Ed courses listed on back**

Year	Autumn Semester	Spring Semester	Yr.
1 <sup>st</sup>	Chemistry 1*** Chemistry for Engineers 4	CSE 1221 or Engineer 1221 Computer Programming 2	32
	Engineer 1100.01 Engineering Survey I 0.5	Engineer 1100.02 Engineering Survey II 0.5	
	Engineer 1181 Intro to Engineering I 2	Engineer 1182 Intro to Engineering II 2	
	Math 1151 Engineering Calculus I 5	English 1110 First-year English Composition 3	
	General Education course 3	Math 1152 Engineering Calculus II 5	
	Target: 14.5	Physics 1131 Physics I 5	Target: 17.5
2 <sup>nd</sup>	FABE 2110 Fundamentals of FABE I 4	Engineer 4410 Computer Graphics 2	33
	FABE 2710 Surveying 2	FABE 2120 Fundamentals of FABE II 4	
	Math 2*** Multivar. Calc. & Diff. Eqns. 4	FABE 2720 Soil & Water Engineering 3	
	Mech Eng 2010 Statics 2	Mech Eng 2020 Mechanics of Materials 3	
	Physics 1132 Physics II 5	Applied Biological or Agricultural Science elective course 4	
	Target: 17.0	Target: 16.0	
3 <sup>rd</sup>	Engineering 2367 Writing for Engineers 3	FABE 3140 Professional Development 1	34
	FABE 3130 Fundamentals of FABE III 4	FABE 3150 System Dynamics & Electricity 4	
	ISE 2040 Engineering Economics 2	FABE 3610 Power & Hydraulics 3	
	Mech Eng 2030 Dynamics 3	FABE 3810 Structures in FABE 3	
	General Education course 3	General Education course 3	
	Target: 17.0	Technical Elective 3	Target: 17.0
4 <sup>th</sup>	FABE 4900 Capstone design I 3	FABE 4170 Senior Exit Survey 0	33
	FABE 5160 Electronics, Measurement, & Instrumentation 4	FABE 4910 Capstone design II 3	
	FABE 5820 HVAC in FABE 3	FABE 5730 Drainage or FABE 5740 Irrigation 2	
	General Education course 3	General Education course 3	
	Technical Elective 3	Technical Elective 3	
	Target: 16.0	Technical Elective 3	Target: 17.0

**Technical Electives: 14 hrs**  
(any engineering course, level 3000 +)

( ) \_\_\_\_\_

( ) \_\_\_\_\_

( ) \_\_\_\_\_

( ) \_\_\_\_\_

( ) \_\_\_\_\_

Tech. Elects Total:

**Applied Biol. or Ag. Science: 4 hrs**

( ) \_\_\_\_\_

**General Education Requirements: 24 hours**

Foundations:

English 1110 3 \_\_\_\_\_

Second Writing Course \_\_\_\_\_

Engineering 2367 3 \_\_\_\_\_

Arts and Humanities:<sup>2</sup>

History: \_\_\_\_\_ 3 \_\_\_\_\_

Literature: \_\_\_\_\_ 3 \_\_\_\_\_

Arts Elective: \_\_\_\_\_ 3 \_\_\_\_\_

Social Science:<sup>2</sup>

1st Course: \_\_\_\_\_ 3 \_\_\_\_\_

2nd Course: \_\_\_\_\_ 3 \_\_\_\_\_

Other GEs

Culture & Ideas: Ethics \_\_\_\_\_ 3 \_\_\_\_\_

1st Global Studies Course: \_\_\_\_\_ 0 \_\_\_\_\_

2nd Global Studies Course: \_\_\_\_\_ 0 \_\_\_\_\_

General Education Total:

<sup>1</sup>Alt. for Honors: Engineering 1191 & 1192 replace Engineering 1181, 1182, and Computer Programming

<sup>2</sup>Global Studies Requirement: All students must complete two GE Global Studies courses. Select two classes in the Arts and Humanities or Social Science categories that can also meet this requirement in order to avoid taking extra courses.

Required Engineering Courses (ABET 48): 62 \_\_\_\_\_

Math and Science Courses (ABET 32): 32 \_\_\_\_\_

General Education: 24 \_\_\_\_\_

Technical Electives: 14 \_\_\_\_\_

Minimum Required to Graduate:  132 Total Earned:

**BIOLOGICAL ENGINEERING Specialization, BS in Food, Agricultural, and Biological Engineering**

Academic Year 12-13

Suggested GUIDE only. Semesters of offerings subject to change.

PROPOSED

Name: \_\_\_\_\_ Student ID# \_\_\_\_\_ E-Mail: \_\_\_\_\_ @osu.edu

Bolded courses offered once/year.

<sup>1</sup>Alternative (alt.) courses noted below & Gen Ed courses listed on back

Year	Autumn Semester		Spring Semester	Yr.
1 <sup>st</sup>	Biology 1*** Quantitative Biology	3	Chemistry 1122 General Chemistry II	5
	Chemistry 1121 General Chemistry I	5	Engineer 1100.02 Engineering Survey II	0.5
	Engineer 1100.01 Engineering Survey I	0.5	Engineer 1182 Intro to Engineering II	2
	Engineer 1181 Intro to Engineering I	2	Math 1152 Engineering Calculus II	5
	Math 1151 Engineering Calculus I	5	Physics 1131 Physics I	5
	<b>Target: 15.5</b>		<b>Target: 17.5</b>	33
2 <sup>nd</sup>	English 1110 First-year English Composition	3	Chem **** Organic Chemistry Survey (or Organic Chem I)	4
	<b>FABE 2110 Fundamentals of FABE I</b>	4	CSE 1221 or Engineer 1221 Computer Programming	2
	Math 2*** Multivar. Calc. & Diff. Eqns.	4	Mech Eng 2040 Statics & Mechanics of Materials	4
	Physics 1132 Physics II	5	<b>FABE 2120 Fundamentals of FABE II</b>	4
			<i>FABE 2720 or Advanced Biology elective course</i>	3
	<b>Target: 16.0</b>		<b>Target: 17.0</b>	33
3 <sup>rd</sup>	Engineer 2367 Writing for Engineers	3	<b>FABE 3140 Professional Development</b>	1
	Engineer 4410 Computer Graphics	2	<b>FABE 3150 System Dynamics &amp; Electricity</b>	4
	<b>FABE 3130 Fundamentals of FABE III</b>	4	<b>FABE 3510 Biological Engineering</b>	4
	ISE 2040 Engineering Economics	2	<i>Advanced Biology elective course (or Biochemistry)</i>	3
	ISE 3800 Engineering Project Management	2	<i>General Education course</i>	3
	<i>Advanced Biology elective course (or Organic Chem II)</i>	4	<i>General Education course</i>	3
	<b>Target: 17.0</b>		<b>Target: 18.0</b>	35
4 <sup>th</sup>	<b>FABE 4900 Capstone design I</b>	3	<b>FABE 4170 Senior Exit Survey</b>	0
	<b>FABE 5160 Electronics, Measurement, &amp; Instrumentation</b>	4	<b>FABE 4910 Capstone design II</b>	3
	<i>General Education course</i>	3	<i>General Education course</i>	3
	<i>General Education course</i>	3	<i>General Education course</i>	3
	<i>Technical Elective</i>	3	<i>Technical Elective</i>	3
	<b>Target: 16.0</b>		<b>Target: 15.0</b>	31

**Technical Electives: 9 hours**  
(any engineering or biological science course, level 3000 +)

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

Tech. Elects Total:

**Advanced Biology Electives: 10 hrs**  
(e.g., microbiology, anatomy, physiology, molecular genetics, nutrition)

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

Adv. Biology Total:

**General Education Requirements: 24 hours**

<b>Foundations:</b>	<b>Other GEs</b>
English 1110 _____ 3	Culture & Ideas: Ethics _____ 3
Second Writing Course _____ 3	1st Global Studies Course: _____ 0
Engineering 2367 _____ 3	2nd Global Studies Course: _____ 0
<b>Arts and Humanities:<sup>2</sup></b>	
History: _____ 3	
Literature: _____ 3	
Arts Elective: _____ 3	
<b>Social Science:<sup>2</sup></b>	
1st Course: _____ 3	
2nd Course: _____ 3	
<b>General Education Total:</b> <input style="width: 50px;" type="text"/>	

<sup>1</sup>Alt. for Honors: Engineering 1191 & 1192 replace Engineering 1181, 1182, and Computer Programming

<sup>2</sup>Global Studies Requirement: All students must complete two GE Global Studies courses. Select two classes in the Arts and Humanities or Social Science categories that can also meet this requirement in order to avoid taking extra courses.

Required Engineering Courses (ABET 48):	48
Required Math and Science Courses (ABET 32):	41
General Education:	24
Technical Electives:	9
Adv. Biology electives:	10
Minimum Required to Graduate:	<b>132</b>
Total Earned:	<input style="width: 50px;" type="text"/>

**ECOLOGICAL ENGINEERING Specialization, BS in Food, Agricultural, and Biological Engineering**

Academic Year 12-13

Suggested GUIDE only. Semesters of offerings subject to change.

PROPOSED

Name: \_\_\_\_\_ Student ID# \_\_\_\_\_ E-Mail: \_\_\_\_\_ @osu.edu

Bolded courses offered once/year.

**<sup>1</sup>Alternative (alt.) courses noted below & Gen Ed courses listed on back**

Year	Autumn Semester	Spring Semester	Yr.
1 <sup>st</sup>	Biology 1*** Quantitative Biology 3	CSE 1221 or Engineer 1221 Computer Programming 2	32
	Chemistry 1xxx Chemistry for Engineers 4	Engineer 1100.02 Engineering Survey II 0.5	
	Engineer 1100.01 Engineering Survey I 0.5	Engineer 1182 Intro to Engineering II 2	
	Engineer 1181 Intro to Engineering I 2	English 1110 First-year English Composition 3	
	Math 1151 Engineering Calculus I 5	Math 1152 Engineering Calculus II 5	
	Physics 1131 Physics I 5	Physics 1131 Physics I 5	
	<b>Target: 14.5</b>	<b>Target: 17.5</b>	
2 <sup>nd</sup>	EEOB **** Ecology I 3	Chemistry **** Organic Chemistry Survey 4	35
	FABE 2110 Fundamentals of FABE I 4	EEOB **** Ecology II 3	
	FABE 2710 Surveying 2	FABE 2120 Fundamentals of FABE II 4	
	Math 2*** Multivar. Calc. & Diff. Eqns. 4	FABE 2720 Soil & Water Engineering 3	
	Physics 1132 Physics II 5	General Education course 3	
	<b>Target: 18.0</b>	<b>Target: 17.0</b>	
3 <sup>rd</sup>	Engineer 2367 Writing for Engineers 3	FABE 3140 Professional Development 1	34
	Engineer 4410 Computer Graphics 2	FABE 3150 System Dynamics & Electricity 4	
	FABE 3130 Fundamentals of FABE III 4	FABE 5310 Ecological Engineering & Science 3	
	ISE 2040 Engineering Economics 2	General Education course 3	
	ISE 3800 Engineering Project Management 2	General Education course 3	
	Mech Eng 2040 Statics & Mechanics of Materials 4	Technical Elective 3	
	<b>Target: 17.0</b>	<b>Target: 17.0</b>	
4 <sup>th</sup>	FABE 4900 Capstone design I 3	FABE 4170 Senior Exit Survey 0	31
	FABE 5160 Electronics, Measurement, & Instrumentation 4	FABE 4910 Capstone design II 3	
	FABE 5750 Watershed Hydrology 3	FABE 5550 Design of Sustainable Waste Mgt Sys. 3	
	General Education course 3	General Education course 3	
	Technical Elective 3	Technical Elective 3	
	<b>Target: 16.0</b>	<b>Target: 15.0</b>	

**Technical Electives: 9 hours**  
(any engineering or science course related to Eco.Eng., level 3000 +)

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

\_\_\_\_\_ ( )

Tech. Elects Total:

**General Education Requirements: 24 hours**

**Foundations:**

English 1110 3 \_\_\_\_\_

Second Writing Course \_\_\_\_\_ 3 \_\_\_\_\_

Engineering 2367 \_\_\_\_\_ 3 \_\_\_\_\_

**Arts and Humanities:<sup>2</sup>**

History: \_\_\_\_\_ 3 \_\_\_\_\_

Literature: \_\_\_\_\_ 3 \_\_\_\_\_

Arts Elective: \_\_\_\_\_ 3 \_\_\_\_\_

**Social Science:<sup>2</sup>**

1st Course: \_\_\_\_\_ 3 \_\_\_\_\_

2nd Course: \_\_\_\_\_ 3 \_\_\_\_\_

**Other GEs**

Culture & Ideas: Ethics \_\_\_\_\_ 3 \_\_\_\_\_

1st Global Studies Course: \_\_\_\_\_ 0 \_\_\_\_\_

2nd Global Studies Course: \_\_\_\_\_ 0 \_\_\_\_\_

General Education Total:

<sup>1</sup> Alt. for Honors: Engineering 1191 & 1192 replace Engineering 1181, 1182, and Computer Programming	Required Engineering Courses (ABET 48):	58
	Math and Science Courses (ABET 32):	41
<sup>2</sup> Global Studies Requirement: All students must complete two GE Global Studies courses. Select two classes in the Arts and Humanities or Social Science categories that can also meet this requirement in order to avoid taking extra courses.	General Education:	24
	Technical Electives:	9
	Minimum Required to Graduate:	132
	Total Earned:	<input type="text"/>



### **Pre-Major Requirements**

Acceptance into the BS in **Food, Agricultural and Biological Engineering** program depends upon the cumulative point-hour ratio (CPHR) and the secondary point-hour ratio (SPHR) at completion of the following pre-major courses: *Math 1151, 1152; Physics 1131; and Engineering 1100.01/1100.02, 1181, and 1182, or their equivalents*. A minimum SPHR of 2.0 is required. Students with a CPHR of 3.0 are assured of acceptance.

**CREDIT HOUR EXPLANATION**

Program credit hour requirements		A.) Number of credit hours in current program <i>(Quarter credit hours)</i>	B.) Calculated result for 2/3rds of current quarter credit hours  <i>(On-line version will multiply the value in column A by 0.667 and round to the nearest tenth)</i>	C.) Number of credit hours required for proposed program  <i>(Semester credit hours)</i>	D.) Change in credit hours  <i>(Absolute value of difference between columns B and C)</i>
Total minimum credit hours required for completion of program <i>(all specializations)</i>		195	130.1	132	1.9
Required credit hours offered by the unit:	Food Eng	33	22.0	33	11.0
	Agri. Eng	48	32.0	43	11.0
	Biol. Eng	44	29.3	31	1.7
	Ecol. Eng	n/a	n/a	41	n/a
Required credit hours offered outside of the unit:	Food Eng	147	98.0	90	8.0
	Agri. Eng	123	82.0	75	7.0
	Biol. Eng	137	91.4	92	0.6
	Ecol. Eng	n/a	n/a	91	n/a
Technical electives <i>(may be taken in or outside the unit):</i>	Food Eng	15	10.0	9	1.0
	Agri. Eng	24	16.0	14	2.0
	Biol. Eng	14	9.3	9	0.3
	Ecol. Eng	n/a	n/a	9	n/a
Required prerequisite credit hours not included above		0	0	0	0

**Rationale for the changes in credit hours**

The Food Engineering and Ag Engineering specializations had increases in credit hours within the department due to the integration of fluid dynamics, thermodynamics, heat transfer and mass transport topics into the Fundamentals of FAFE course sequence. These topics had previously been taken through various courses in Civil Engineering, Mechanical Engineering, and Chemical & Biomolecular Engineering, with no consistency between FAFE specializations. Specifically, food engineering tended to use chemical engineering courses, agricultural engineering tended to

use civil and mechanical engineering courses, and biological engineering effectively used courses from all three departments. Also, the Food and Ag Engineering specializations are proposing slight increases in hours devoted to topics specific to food and agricultural engineering topics, respectively. Although the biological engineering specialization also proposes to use the integrated Fundamentals of FAFE course sequence, the percentage of required outside credit hours remained relatively unchanged due to a decrease in the number of other FAFE topical courses required in the semester curriculum. The ecological engineering specialization, as a formally approved sub-plan, is new.

### TRANSITION POLICY

We, the faculty and staff of Department of Food, Agricultural, and Biological Engineering pledge that our undergraduate students' progress toward graduation will not be delayed by the conversion to semesters. We think the quality and value of our degree programs will be improved under the new semester curricula, and that the transition will occur without increasing time to degree. Our approach for advising undergraduate students is to prepare an Individual Advising Plan for each student to fill out and go over with their academic advisor. This plan will spell out how each student will complete the remaining requirements for their degree from the summer of 2012 until graduation in such a way that meets the student's needs and does not delay graduation compared to what would have been the case had OSU remained on quarters.

– *Sudhir Sastry, Professor and Interim Chair*

The transition policy is based on the following principles:

- All students who graduate under semesters, even during the first semester in summer 2012, will do so by meeting the requirements of the semester program.
- Each semester program requirement may be met either by taking an appropriate semester course (or sequence), or by substituting a substantially equivalent quarter course (or sequence) for the corresponding semester course (or sequence).
- Excess equivalent credit hours resulting from such substitutions—whether positive or negative—will be credited against technical elective requirements.

The agricultural engineering specialization's transition plan is presented here as an example of the approach that will be taken. Each year is detailed separately, and individual student transition plans will be developed using the most appropriate one of these templates as a beginning basis.

1. For students starting Au 2009 (who will be seniors Au 2012):

<u>Au 2012</u>	<u>Hrs</u>	<u>Sp 2013</u>	<u>Hrs</u>
FABE 4900	3	FABE 4170	0
FABE 5161	3	FABE 4910	3
FABE 5820	3	FABE 5730 or 5740	2
Tech Elects		Tech Elects	
GECs		GECs	

Notes:

- FABE 5161 is a bridge course for FABE 605 to be offered one time only in Au 2012.

- FAFE 695 will be offered Sp 2012. If not completed then, student will need to take FAFE 3140 Professional Development in Sp 2013.
- Tech Elect hours =  $18\frac{2}{3}$  semester hours [ $\frac{2}{3}$  of 28 qtr hrs (24 Tech elect hrs plus FAFE 625)]. Adjustments to semester Tech Elect hours are as follows:

	$18\frac{2}{3}$ hrs
FAFE 5161	- $\frac{1}{3}$
FAFE 4900 and 4910	- 2
FAFE 5820	- $\frac{1}{3}$
FAFE 5730 or 5740	<u>+ <math>\frac{2}{3}</math></u>
Total Required	$16\frac{2}{3}$ hrs

- Tech elective hours completed under quarters are multiplied by  $\frac{2}{3}$  to give equivalent semester hours. Total tech elective hours from converted quarter course hours plus those taken under semesters must equal  $16\frac{2}{3}$  hrs.
- GEC hours completed under quarters are multiplied by  $\frac{2}{3}$  to give equivalent semester hours. Total GEC hours from converted quarter course hours plus those taken under semesters must equal 24 hrs.

2. For students starting Au 2010 (who will be juniors Au 2012):

<u>Au 2012</u>	<u>Hrs</u>	<u>Sp 2013</u>	<u>Hrs</u>
FAFE 2120	4	FAFE 3140	1
FAFE 3130	4	FAFE 3150	4
ISE 2040	2	FAFE 3610	3
ME 2030	3 (if no ME 430)	FAFE 3810	3
Tech Elects		Tech Elects	
GECs		GECs	

<u>Au 2013</u>	<u>Hrs</u>	<u>Sp 2014</u>	<u>Hrs</u>
FAFE 4900	3	FAFE 4170	0
FAFE 5160	4	FAFE 4910	3
FAFE 5820	3	FAFE 5730 or 5740	2
Tech Elects		Tech Elects	
GECs		GECs	

Notes:

- FAFE 2120 will be offered both semesters during 2012-13, and FAFE 3130 will be taught concurrently with FAFE 2120. After this year FAFE 2120 will be a prerequisite for FAFE 3130.
- Tech Elect hours =  $18\frac{2}{3}$  semester hours [ $\frac{2}{3}$  of 28 qtr hrs (24 Tech elect hrs plus FAFE 625)]. Adjustments to semester Tech Elect hours are as follows:

	$18\frac{2}{3}$ hrs
FAFE 3140	- $\frac{1}{3}$
FAFE 3610	- $\frac{1}{3}$
FAFE 3810	- $\frac{1}{3}$
FAFE 4900 and 4910	- 2
FAFE 5820	- $\frac{1}{3}$
FAFE 5730 or 5740	<u>+ <math>\frac{2}{3}</math></u>
Total Required	16 hrs



- Tech elective hours completed under quarters are multiplied by  $\frac{2}{3}$  to give equivalent semester hours. Total tech elective hours from converted quarter course hours plus those taken under semesters must equal 16 hrs.
- GEC hours completed under quarters are multiplied by  $\frac{2}{3}$  to give equivalent semester hours. Total GEC hours from converted quarter course hours plus those taken under semesters must equal 24 hrs.

3. For Students starting Au 2011 (will be sophomores Au 2012):

<u>Au 2012</u>	<u>Hrs</u>	<u>Sp 2013</u>	<u>Hrs</u>
Physics <sup>1</sup>		ME 2020	3
Math <sup>1</sup>		Adv CAD	2
ME 2010	2	Appl Bio	4
FABE 2710	2	FABE 2720	3
FABE 2110	4	FABE 2120	4
		GEC	

<u>Au 2013</u>	<u>Hrs</u>	<u>Sp 2014</u>	<u>Hrs</u>
FABE 3130	4	FABE 3140	1
ISE 2040	2	FABE 3150	4
ME 2030	3	FABE 3610	3
Tech Elects		FABE 3810	3
GECs		Tech Elects	
		GECs	

<u>Au 2014</u>	<u>Hrs</u>	<u>Sp 2015</u>	<u>Hrs</u>
FABE 4900	3	FABE 4170	0
FABE 5160	4	FABE 4910	3
FABE 5820	3	FABE 5730 or 5740	2
Tech Elects		Tech Elects	
GECs		GECs	

Notes:

- <sup>1</sup>Physics and Math courses to conform to transition plans by the departments offering those courses.
- Tech Elect hours = 14 semester hours (it is unlikely students will have started tech elects before switch to semesters)
- Any tech elective hours completed under quarters are multiplied by  $\frac{2}{3}$  to give equivalent semester hours. Total tech elective hours from converted quarter course hours plus those taken under semesters must equal 16 hrs. Adjustments to semester Tech Elect hours:

	16 hrs
FABE 3610	- $\frac{1}{3}$
FABE 3810	- $\frac{1}{3}$
FABE 4150	- $\frac{1}{3}$
FABE 4900 and 4910	- 2
FABE 5420	- $\frac{1}{3}$
FABE 5730 or 5740	+ $\frac{2}{3}$
Total Required	13 $\frac{1}{3}$ hrs

- GEC hours completed under quarters are multiplied by  $\frac{2}{3}$  to give equivalent semester hours. Total GEC hours from converted quarter course hours plus those taken under semesters must equal 24 hrs.
- Students will be strongly advised to not begin any course sequence under quarters that cannot be completed before the transition to semesters. The proposed Fundamentals of FABE course sequence (FABE 2110 / 2120 / 3130) replaces FABE 225 / 325, CE 413, ChBE 420 / 521 / 522, and ME 501 / 510 (with different specializations choosing different courses from among this list). If FABE 325 and CE 413/ ChBE 420 were already completed under quarters, the student would start the sequence in FABE 2120.

### **ASSESSMENT CONVERSION**

We do not envision any significant modifications to the assessment practices presently in place. Student portfolios will continue to be assigned and evaluated in the professional development course. Capstone design projects will also continue to be evaluated by faculty and industry sponsors and advisory council members in the capstone sequence. Faculty will choose, through discussion and consensus, where to include embedded testing in the new semester-based curriculum. The current (2005) assessment plan based on FABE's accreditation requirements has been entered into OAA's assessment survey.