CURRICULUM IN AGRICULTURAL & BIOLOGICAL ENGINEERING — Fall 2012

UNIVERSITY of ILLINOIS at URBANA-CHAMPAIGN

For the degree of Bachelor of Science in Agricultural and Biological Engineering

BIOLOGICAL ENGINEERING CONCENTRATION

Agricultural and biological engineering is the application of mathematics, physical and biological science, and engineering to agriculture, food systems, energy, the environment, and related biological systems. The ABET-accredited B.S. Degree in Agricultural and Biological Engineering provides a concentration in **Biological Engineering** that integrates life sciences with engineering in the advancement and application of fundamental concepts of biological systems from molecular to ecosystem levels. Understanding the complexity inherent to biological systems is important in designing solutions in the areas of bioenergy, bioprocessing, nanotechnology, biosensing, bio-informatics, and bioenvironment. Within this concentration, student are required to select a set of coherent courses that constitutes a specialization in their area of career interest either from the following list or a customized area chosen in consultation with an advisor: Bioenvironmental Engineering, Ecological Engineering, Food and Bioprocess Engineering, Nanoscale Biological Engineering.

FIRST YEAR

First Semester	Hours	Second Semester	Hours
ABE 100 - Intro Agric & Biological Engrg	1	ABE 141 – ABE Principles: Biological	2
CHEM 102 - General Chemistry I	3	CHEM 104 - General Chemistry II*	3
CHEM 103 - General Chemistry Lab I	1	CHEM 105 - General Chemistry Lab II*	1
ENG 100 - Engineering Orientation	0	MATH 231 – Calculus II	3
GE 101 - Engineering Graphics & Design or		PHYS 211 – University Physics: Mechanics	4
RHET 105 - Principles of Composition[1]	3-4	RHET 105 - Principles of Composition or	
MATH 221 - Calculus I[2]	4	GE 101 - Engineering Graphics & Design[1]	4-3
Liberal education elective[3]	3	Total	17-16
Total	15-16	*Biological Version Recommended	

SECOND YEAR

ABE 223 – ABE Principles: Machine Syst	2	ABE 225 – ABE Principles: Bioenvironment	2
ABE 224 – ABE Principles: Soil & Water	2	ABE 226 – ABE Principles: Bioprocessing	2
CS 101 - Intro Computing: Engrg & Sci	3	MATH 225 - Introductory Matrix Theory	2
MATH 241 - Calculus III	4	MATH 285 - Intro Differential Equations	3
PHYS 212 - University Physics: Elec & Mag	4	CHEM 232 – Elementary Organic Chemistry I	3
TAM 210 - Intro to Statics or		PHYS 213 - University Physics: Thermal Physics	2
TAM 211 - Statics[5]	2	TAM 212 - Introductory Dynamics	3
Total	17	Total	17

THIRD YEAR

ABE 341 – Transport Processes in ABE	3	CHBE 321 - Thermodynamics	4
ECE 205 - Elec and Electronic Circuits	3	ECON 103 - Macroeconomic Principles[3]	3
MCB 150 – Molec & Cellular Basis of Life	4	Agricultural & biological engineering technical elective[7]	3
Agricultural & biological engineering technical elective[7]	3	Biological and natural sciences elective[6]	3
Liberal education elective[3]	3	Liberal education elective[3]	3
Total	16	Total	16

FOURTH YEAR

ABE 430 - Project Management	2	ABE 469 – Industry-Linked Design Project[4]	4
Agricultural & biological engineering technical elective[7]	3	Biological and natural sciences elective[6]	3
Technical elective[7]	3	Technical elective[7]	3
Liberal education elective[3]	3	Liberal education elective[3]	3
Free elective	3	Free elective	3
Total	14	Total	16

TOTAL HOURS FOR DEGREE. . . 128

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[1] RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is GE 101. Students may take SPCM 111 and 112 in place of RHET 105.

[2] MATH 220 – Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

[3] Students must satisfy the 18-hour liberal education requirements of the College of Engineering, including ECON 103 (or either ECON 102 or ACE 100 by permission) and the campus general education requirements for social sciences and humanities.

[4] ABE 469 satisfies the general education advanced composition requirement.

[5] The extra hour of credit for this course may be used to help meet free elective requirements.

[6] Students in the Biological Engineering concentration must complete 6 hours from the Biological and Natural Sciences approved list.

[7] Students must complete 15 hours of technical electives; at least 8 hours must be from the approved list of Agricultural and Biological Engineering courses and the remainder selected from the approved Other Technical Electives List.

Biological and Natural Sciences (6 hours minimum with one course fulfilling a lab requirement)

CHEM	233#	Elementary Organic Chemistry Lab I	3
CPSC	261	Biotechnology in Agriculture	3
CPSC	265	Genetic Engineering Lab	3
FSHN	101	Intro Food Science & Nutrition	3
FSHN	274	NonMajors Food Microbiology	1
FSHN	414	Food Chemistry	3
FSHN	416#	Food Chemistry Laboratory	2
FSHN	461	Food Processing I	3
FSHN	462	Food Processing II	3
FSHN	471	Food and Industrial Microbiology	3
GEOG	406	Fluvial Geomorphology	4
GEOG	468	Biological Modeling	3-4
GEOG	469	Spatial Ecosystem Modeling	3-4
IB	150	Organismal & Evolutionary Biol	4
IB	151#	Organismal & Evol Biol Lab	1
IB	203	Ecology	4
IB	452	Ecosystem Ecology	3
MCB	151#	Molec and Cellular Laboratory	1
MCB	250	Molecular Genetics	3
MCB	409	Bioinformatics and Func Genomics	3
MCB	426	Bacterial Pathogenesis	3
MCB	450	Introductory Biochemistry	3
NRES	219	Principles of Ecosystem Mgmt	3
NRES	419	Env and Plant Ecosystems	3
NRES	420	Restoration Ecology	4
NRES	427	Modeling Natural Resources	4
NRES	439	Env and Sustainable Dev	3
NRES	456	Integrative Ecosystem Mgmt	3

#Eligible courses meeting laboratory requirement.
Other courses with a strong biological or biotech content may be approved by chief advisor.

Technical Electives for Biological Engineering Concentration (15 hours minimum with one course fulfilling a lab requirement)

Agricultural & Biological Engineering Technical Electives; at least 8 hours from:

ABE	374#	Env Control for Buildings	3
ABE	397*	Independent Study	1-4
ABE	398*	Special Topics	1-4
ABE	425#	Engrg Measurement Systems	4
ABE	436	Renewable Energy Systems	3
ABE	446	Biological Nanoengineering	3-4
ABE	455	Erosion and Sediment Control	2
ABE	456#	Land & Water Resources Engineering	3-4
ABE	457	NPS Pollution Processes	2
ABE	458	NPS Pollution Modeling	2
ABE	459#	Drainage and Water Management	3-4
ABE	476#	Indoor Air Quality Engineering	4
ABE	483#	Engrg Properties of Food Matls	3
ABE	488	Bioprocessing Biomass for Fuel	3
ABE	489	Corn Milling Process Design	3
ABE	497*	Independent Study	1-4
ABE	498*	Special Topics	1-4

*Technical elective credit may be given with chief advisor approval.
#Eligible course meeting laboratory requirement.

Other Technical Electives; remainder of the 15 hours from list below or any 300 or 400 level engineering course approved by advisor:

CEE	330	Environmental Engineering	3
CEE	430	Ecological Quality Engineering	2
CEE	431	Biomonitoring	3
CEE	432	Stream Ecology	3
CEE	437	Water Quality Engineering	3
CEE	444	Env Eng Principles, Biological	3
CEE	449#	Environmental Engineering Lab	3
CHBE	221	Principles of CHE	3
CHBE	421	Momentum and Heat Transfer	4
CHBE	422	Mass Transfer Operations	4
CHBE	471	Biochemical Engineering	3
CHBE	472	Techniques in Biomolecular Engineering	3
CS	466	Introduction to Bioinformatics	3
ECE	206#	Elec & Electronic Circuits Lab	1
ECE	416	Biosensors	3
ECE	475	Modeling of Bio-Systems	3-4
ECE	480	Magnetic Resonance Imaging	3
MSE	470	Design and Use of Biomaterials	3
MSE	472#	Biomaterials Laboratory	3
TAM	461	Cellular Biomechanics	4

Eligible course meeting laboratory requirement.
Other courses may be approved by chief advisor.