

**TO:** The Engineering Faculty

**FROM:** Agricultural and Biological Engineering

**RE:** Changes in degree requirements for Bachelor of Science in Agricultural Engineering with a major in Environmental and Natural Resources Engineering for students entering Fall 2021 or later

The Faculty of the Department of Agricultural and Biological Engineering has approved the following changes. This action is now submitted to the Engineering Faculty with a recommendation for approval.

**Summary of Changes:**

- Remove NUCL 27300 – Mechanics of Materials from requirements.
- Remove ABE 33000 - Design of Machine Components from requirements.
- Remove ABE 45000 - Finite Element Analysis from requirements.
- Add CE 38300 - Geotechnical Engineering I to requirements.
- Add Computer Science Course
  - CS 15900, CS 17700, CS 18000++
- Add requirement to take either ABE 42500 – Water Quality Engineering or ABE 42600 – Ecological Restoration Engineering, which will be offered in alternating years.

**REASON:**

Students in the ABE Environmental and Natural Resources (ENRE) major are increasingly seeking employment in growing sectors of land and water resources engineering, particularly consulting companies who complete projects for counties, municipalities, and private industry. Much of the projects they are interested in are focused on land and water engineering, and require coursework that integrates climate, water quality, and ecology to develop holistic designs that are resilient to land use and climate changes. Feedback from consulting engineers and our advisory board highlights the need for students to increase their knowledge and experience in design related to soil/sediment erosion, slope stability of channels/ditches, floodplain delineation, stormwater management, and restoration. Though such topics are the focus of research and graduate teaching for ENRE faculty, the current plan of study is heavy on Agricultural Engineering / Machine Systems Engineering courses, including Mechanics of Materials (NUCL 27300), Finite Element Analysis (ABE 45000), and Machine System Design (ABE 33000). This heavy weighting towards courses of less direct relevance to current ENRE students results in confusion over the goals of the program and is a likely contributor to lower program enrollment given the continued interest in our field.

**Environmental and Natural Resources Engineering Plan of Study Revisions**  
**Present** **Proposed**

***Freshman Year***

**First Semester**

(4) CHM 11500 General Chemistry I		
(3) Written Communication Selective		No Change
(2) ENGR 13100 Transforming Ideas to Innovation I		
(4) MA 16500 Plane Analytic Geometry and Calculus I		
(3) UCC Approved Humanities Selective		
<b>16</b>	<b>16</b>	

**Second Semester**

(4) CHM 11600 General Chemistry II	(3) CS	CS Selective – CS 15900/17700/17XXX
(3) Oral Communication Selective	(3)	Oral Communication Selective
(4) MA 16600 Plane Analytic Geometry and Calculus II	(4) MA 16600	Plane Analytic Geometry and Calculus II
(4) PHYS 17200 Modern Mechanics	(4) PHYS 17200	Modern Mechanics
(2) ENGR 13200 Transforming Ideas to Innovations II	(2) ENGR 13200	Transforming Ideas to Innovations II
<b>17</b>	<b>16</b>	

***Sophomore Year***

**Third Semester**

(3) ABE 20500 Computations for Engineering Systems	(3) ABE 20500	Computations for Engineering Systems
(3) ME 27000 Basic Mechanics I	(3) ME 27000	Basic Mechanics I
(4) MA 26100 Multivariate Calculus	(4) MA 26100	Multivariate Calculus
(3) PHYS 24100 Electricity and Optics	(3) PHYS 24100	Electricity and Optics
(1) ABE 29000 Sophomore Seminar	(1) ABE 29000	Sophomore Seminar
(3) Economics Selective	(4) CHM 11600	General Chemistry II
<b>17</b>	<b>18</b>	

**Fourth Semester**

(3) ABE 21000 Thermodynamics Principles of Engineering and Biological Systems	(3) ABE 21000	Thermodynamics Principles of Engineering and Biological Systems
(4) MA 26200 Linear Algebra and Differential Equations	(4) MA 26200	Linear Algebra and Differential Equations
(3) ME 27400 Basic Mechanics II	(3) ME 27400	Basic Mechanics II
(3) NUCL 27300 Mechanics of Materials	(3) AGRY 25500	Soil Science
(4) Biological Science Selective	(4)	Biological Science Selective
<b>17</b>	<b>17</b>	

<b>Present</b>			<b>Propose</b>		
<b>Junior Year</b>					
<b>Fifth Semester</b>					
(3)	ABE 30500	Physical Properties of Biol. Materials	(3)	ABE 30500	Physical Properties of Biol. Materials
(4)	ABE 32500	Soil and Water Resource Engineering	(4)	ABE 32500	Soil and Water Resource Engineering
(3)	AGRY 25500	Soil Science	(3)		<b>Economics Selective</b>
(3)	CE 34000	Hydraulics (or 4 cr. ME 30900 in place of CE 34000 and 34100)	(3)	CE 34000	Hydraulics (or 4 cr. ME 30900 in place of CE 34000 and 34100)
(1)	CE 34300	Hydraulics Lab (see ME 30900 opt. abv.)	(1)	CE 34300	Hydraulics Lab (see ME 30900 opt. abv.)
(3)		Humanities or Social Sciences Selective	(3)		Humanities or Social Sciences Selective
<b>17</b>			<b>17</b>		
<b>Sixth Semester</b>					
(3)	ABE 31400	Design of Electronic Systems	(3)	ABE 31400	Design of Electronic Systems
(3)	ABE 33000	Design of Machine Components	(3)	ABE 42500/42600	<b>Water Quality Engineering / Ecological Restoration Engineering</b>
(3)		ENRE Technical Selective	(3)	CE 38300	<b>Geotechnical Engineering</b>
(4)		Biological Science Selective	(4)		Biological Science Selective
(3)		Agricultural Selective	(3)		Agricultural Selective
<b>16</b>			<b>16</b>		
<b>Senior Year</b>					
<b>Seventh Semester</b>					
(1)	ABE 49000	Professional Practice in Agr.& Biol. Engr.	(1)	ABE 49000	Professional Practice in Agr.& Biol. Engr.
(1)	ABE 48400	Project Planning and Management	(1)	ABE 48400	Project Planning and Management
(3)	ABE 45000	Finite Element Method in Design and Optimization	(3)		ENRE Technical Selective
(3)		ENRE Technical Selective	(3)		<b>Engineering Technical Selective</b>
(3)		Engineering Technical Selective	(3)		Engineering Technical Selective
(3)		Written & Oral Communication Selective	(3)		Written & Oral Communication Selective
<b>14</b>			<b>14</b>		
<b>Eighth Semester</b>					
(3)	ABE 48600	Agricultural Engineering Design	(3)	ABE 48600	Agricultural Engineering Design
(3)		Engineering Technical Elective	(3)		<b>ENRE Technical Selective</b>
(2)		Humanities or Social Science Selective	(2)		Humanities or Social Science Selective
(3)		Hum. or Soc. Sci. Selective (300+ level)	(3)		Hum. or Soc. Sci. Selective (300+ level)
(1-2)		Free Elective	(2-3)		Free Elective
<b>13/ 14</b>			<b>13/14</b>		
<b>Total 128</b>			<b>Total 128</b>		