IOWA STATE UNIVERSITY

Department of Agricultural and Biosystems Engineering

ABET 2012 Self-Study Report

Agricultural Engineering

ABET
Self-Study Report

for the

Bachelor of Science in Agricultural Engineering

at

Iowa State University

Ames, Iowa

June 30, 2012

CONFIDENTIAL

Table of Contents

GUIDE TO ACRONYMS

A E	Agricultural Engineering (degree program)
AACRAO	American Association of Collegiate Registrars and Admissions Officers
ABE	Agricultural and Biosystems Engineering (department)
ABE ECC	ABE Engineering Curriculum Committee
ACE	American Council on Education
AES	Agricultural and Environmental Systems (option)
AP	Advanced Placement
ATMAE	Association of Technology, Management, and Applied Engineering
BSE	Biological Systems Engineering (degree program)
CLEP	College Level Examination Program
COE	College of Engineering
EAC	External Advisory Council
ECS	Engineering Career Services
FE	Fundamentals of Engineering
IB	International Baccalaureate
IELTS	International English Language Testing System
ISU	Iowa State University
KSA	Knowledge, Skills, and Abilities
PEO	Program Educational Objective
RAI	Regent Admission Index
TOEFL	Test of English as a Foreign Language

BACKGROUND INFORMATION

A. Contact Information

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B. Program History

The Agricultural Engineering (A E) program was created in 1905 and is arguably[1] the oldest such program in the country. The program initially focused on farm mechanics, farm buildings, and farm machinery. The first degree in agricultural engineering was awarded to J. A. Waggoner in 1910. By 1929, "divisions of emphasis," as options were then called, included farm machinery and power, rural structures, and drainage and irrigation. In the 1960s, options included power and machinery, structures and environment, soil and water, and electric power and processing. A food engineering option was added in the 1970s. During the 1980's farm crisis, enrollment plummeted to well below 100, but the department continued to fulfill its three-fold mission of education, research and extension. In 1991 the department changed its name from *Agricultural Engineering* to *Agricultural and Biosystems Engineering* (ABE), to better reflect the broadening of the discipline. Student numbers began to rise again in the early 1990s. In 2004, the department merged with the Department of Industrial Education and Technology. Consequently, the department now comprises over 30 faculty members and over 550 undergraduates in four programs distinct degree programs: Agricultural Engineering (A E), continuously accredited since 1936; Biological Systems Engineering (BSE), launched 2008 and undergoing initial accreditation during this 2012 accreditation cycle; Agricultural Systems Technology, accredited through ATMAE (Association of Technology, Management, and Applied Engineering); and Industrial Technology, also accredited through ATMAE. The ABE department itself is jointly administered by the College of Agriculture and Life Sciences (CALS) and the College of Engineering (COE) at Iowa State University (ISU); the aforementioned technology degree programs reside within the CALS, while the A E and BSE programs reside within the COE.

The most significant change to the A E program since the last ABET review is the spinning-off of the Food and Bioprocessing Engineering option into the new Biological Systems Engineering degree program (inaugural ABET review in this 2012 cycle). Although Food and Bioprocessing Engineering option oriented students are now going to the Biological Systems Engineering degree program, the A E program has continued to grow, with total student enrollments exceeding 200 several times during the last accreditation cycle, and with Fall 2012 enrollment projected to be 180 students. For context, total enrollment in the 3-year-old Biological Systems Engineering Degree program is projecting a fall 2012 enrollment in

[1] The program at The University of Wisconsin was created in a similar timeframe

excess of 70 students, so that total fall 2012 student in enrollment in ABE engineering programs is projected above 250 students; the highest level ever in the department.

Other important changes to the program since the last ABET review include the following: (1) adding explicit coverage of the Engineering Code of Ethics to the curriculum to address weak performance of our students in this area of the Fundamentals of Engineering (FE) exam; (2) moving the numerical methods class from the sophomore to junior year to address issues of student mathematical preparedness and to thereby increase student learning; (3) creating a new sophomore level open-ended design course to address a gap between freshmen and senior open-ended design experiences; (4) modifying the Program Educational Objectives (PEOs) to reflect the changes in ABET's PEO requirements; and, (5) providing additional course selection guidance to students in the Agricultural and Environmental Systems option to address confusion about how to select courses for a career focused on water and environment issues. Details on these changes, and on the continuous improvement processes that led to them, are provided later in this self-study.

C. Options

Students in the A E BS degree program declare one of two options, below:

1. Agricultural and Environmental Systems Engineering
2. Power and Machinery Engineering

The majority of students enter the program having selected an option, but those who are undecided upon entry typically declare an option during sophomore year.

Curricula for the two options are provided later in this document, but briefly, the Agricultural and Environmental Systems Engineering option (AES) allows students to concentrate their education on engineering solutions needed to protect and conserve soil and water resources, or on the engineering of structures and animal environments. Students in the AES option select advanced coursework from topics such as the following: principles of environmental engineering, microbiology, non-point pollution and control, structural steel design, reinforced concrete design, and design of agricultural structures. The Power and Machinery Engineering option, which typically attracts 80 – 90% of the A E program's students, allows students to focus their education on the engineering related to enhancing the productivity, efficiency, and performance of advanced machinery. These students take advanced coursework from topics such as parametric solid modeling, functional analysis and design of agricultural field machinery; agricultural tractor power, and fluid power engineering.

D. Organizational Structure

Iowa State University is governed by the State of Iowa Board of Regents (Figure 1). The President is the chief executive officer of the university. The Provost is the chief academic officer of the university to whom the individual deans report. The Dean of Engineering is the chief executive officer of the College of Engineering (Figure 2)[2].

[2] Complete organization charts can be found at http://www.president.iastate.edu/org/univorg.pdf and at http://www.engineering.iastate.edu/the-college/office-of-the-dean/coe-organizational-chart/

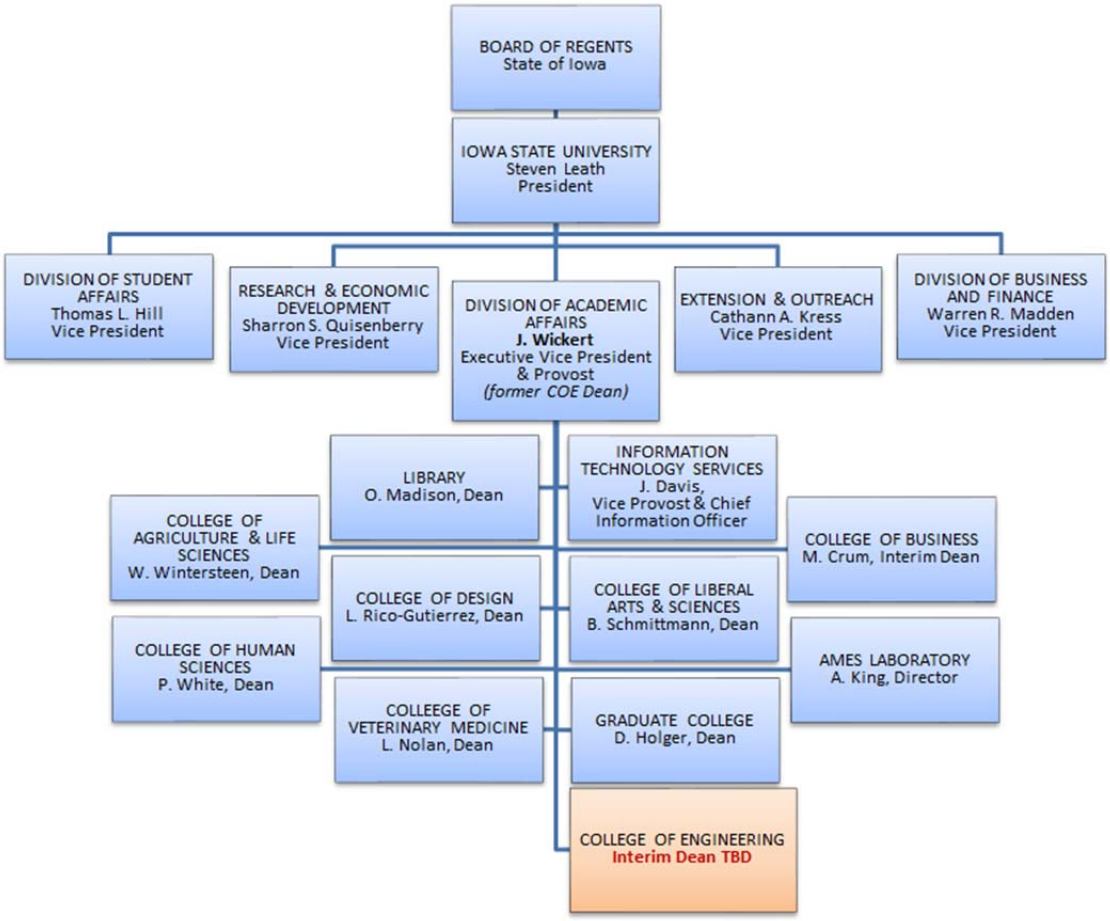

Figure 1. Administrative Structure of Iowa State University, in 2012, showing relationship of College of Engineering (COE) to Board of Regents, and identifying names of key personnel. The COE Dean oversees that college and the associated programs, as illustrated in Figure 2.

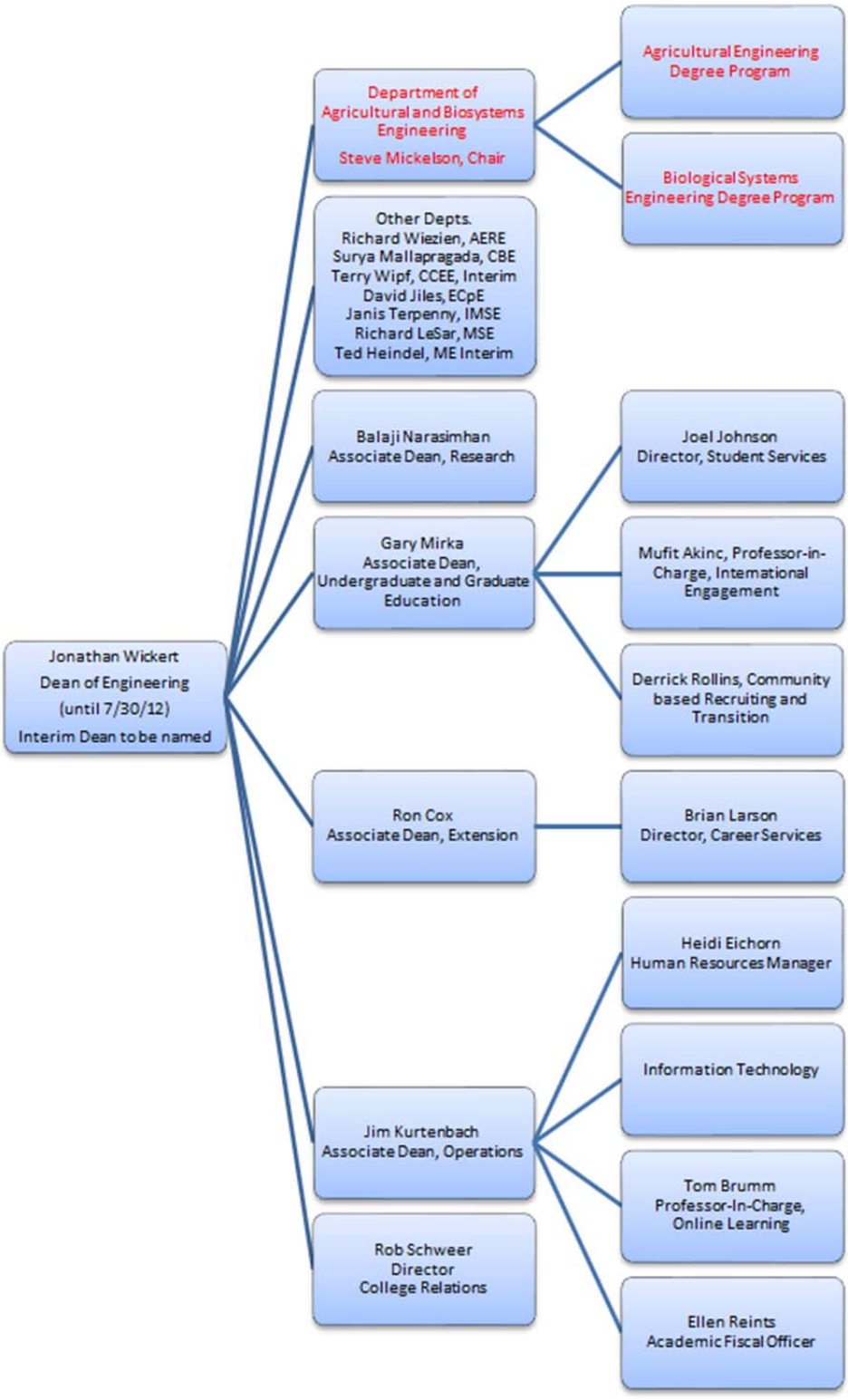

Figure 2. Location of Agricultural Engineering Degree Program within Administrative Structure of the COE at Iowa State University, in 2012.

As shown in figures 1 and 2 above, two engineering degree programs (A E and BSE) are the purview of the ABE Department Chair. The Chair is supported in this oversight by the Associate Chair for Teaching, and by the departmental Engineering Curriculum Committee (ABE ECC), an 11-member body that meets weekly during the academic year and several times per summer (Associate Chair for teaching and ABE ECC are not shown in Figure 2).

The ABE ECC chair (Dr. D. Raj Raman) and vice-chair (Dr. Amy L. Kaleita) have primary responsibility for the ABET report and for running and documenting meetings of the ABE ECC. The ABE ECC chair also has primary responsibility for overseeing the course catalogs, and for signing on student substitution forms, and is assisted in these tasks by the two professional academic advisors (Dr. L. Ancar and Mrs. S. Ziegenbusch, both non-voting members of the ABE ECC) and is advised by the entire ABE ECC. All substantive curricular decisions including those related to course substitutions are the jurisdiction of the faculty membership of the ABE ECC as a whole, not of the ABE ECC chair, nor of the departmental Chair, nor of the Associate Chair for Teaching.

As shown in Figure 2, the departmental administration appoints and oversees the ABE ECC, and in turn answers to the Dean of the College of Engineering (COE). Two additional bodies within the COE have ABET-relevant curricular functions. The college Engineering Curriculum Committee reviews and approves curricular changes in the Agricultural Engineering program, while the office of the Director of Assessment (Dr. Tom Brumm) oversees accreditation of all engineering degree programs at Iowa State University. Dr. Brumm is also Professor-In-Charge, Online Learning, as well as an ABE faculty member with membership in the ABE ECC. His successes in strengthening the assessment and evaluation efforts in multiple ABE programs led him to taking a similar role for the COE, and he provides support to the ABE ECC in its continuous improvement efforts, and in its efforts to prepare for ABET.

E. Program Delivery Modes

The Agricultural Engineering program is offered as an on-campus, four-year, day program, with an optional cooperative education (co-op) program. Courses are primarily offered during normal working hours (M – F, 8 AM – 5 PM), although some research internships, travel courses, and online courses deviate from this schedule. Classes are primarily traditional lecture/laboratory, although most departmental courses and many university courses use a learning management system (Blackboard Learn – which during 2011 – 2012 has replaced WebCT at ISU's campus) and web-based communication tools, and some are offered completely online through the university's Engineering Online Programs office.

F. Program Locations

The program is a residential degree program offered on the campus of Iowa State University in Ames, IA. Travel courses cover all continents except Antarctica, and distance education courses cover large parts of the US and some other nations. Distance education students are not enrolled in the undergraduate A E degree program.

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

No deficiencies or weaknesses were identified by the 2006 accreditation. The single concern raised was as follows:

> *Criterion 3 states, "There must be evidence that the results of this assessment process are applied to the further development of the program." A process is in place to assess program outcomes through the assessment of core engineering competencies, and the results are being used to improve the program. However, the improvement process needs to be formalized to insure its timely operation and uniform application across the curriculum.*

To address this concern, the ABE Engineering Curriculum Committee (ABE ECC, known as simply the Agricultural Engineering Curriculum Committee prior to the BSE degree program's existence), which is the body responsible for oversight of the A E degree program and for the adherence to ABET's requirements immediately proposed a formal process. The Program Response (verbatim) is below:

> *The Agricultural Engineering program, as the Reviewer recognized, has a continuous improvement process to improve the program. The Agricultural Engineering Curriculum Committee will formalize this process to insure its timely operation and uniform application across the curriculum. This formalization will include this timetable:*
>
> - *During summer, the Committee will assemble data on student performance from direct and indirect assessment measures and from other sources.*
> - *During fall semester, the Committee will evaluate these data and decide upon what program changes to recommend.*
> - *At the mid-year Faculty Retreat, the Committee will report to the ABE faculty on student performance and any recommended changes to the program. Program changes approved by the ABE faculty will be implemented by the Committee as soon as practical.*
> - *At the spring meeting of the External Advisory Committee, the Agricultural Engineering Curriculum Committee will report on student performance and seek input and recommended program changes from the departmental External Advisory Committee.*
> - *At the spring Faculty Retreat, the Committee will report to the ABE faculty on any recommended changes to the program as a result of the External Advisory Committee's input. Program changes approved by the ABE faculty will be implemented by the Committee as soon as practical.*
> - *A system of documentation will be created documenting all feedback received for the program, as well as changes made as a result.*

From 2006 through 2011 the ABE ECC implemented the process as written above. Major successes of this effort (detailed in section 4 C below) were the examination of FE data that drove a change in the coverage of ethics in the curriculum, the examination of senior exit interviews and capstone instructor comments that highlighted a curricular gap in open-ended design that was addressed by a major curricular revision (moving a core sophomore class to from spring to fall, eliminating two lower impact junior and senior seminars, and adding a sophomore-level design course in the spring).

There were significant challenges to living up to all of the items described in the list: One such challenge was the time required to compile student work in the ePortfolio system. A second major challenge was the non-representative nature of the work being uploaded to the ePortfolios; viz. students were frequently using freshmen design projects as artifacts for competence in design, when they had much richer materials available from their senior design classes. A final challenge was the partial loss of key assessment/evaluation faculty (notably Mickelson and Brumm) to other positions within the university. For these reasons, in spring 2012, we evaluated the time requirements and effectiveness of the process and determined that significant streamlining was required. We decided this streamlining would result in a more concise, better documented process. To this end, we modified the process to the one detailed in Criterion 4, below. This new process was first used in June 2011 and will be used again in June 2012. Although the June 2012 data will not be presented in this report, we will present it to the site visit team.

H. Joint Accreditation

The program is not jointly accredited, nor is it seeking joint accreditation.

GENERAL CRITERIA
CRITERION 1: STUDENTS

A. Student Admissions

Admissions requirements are published in the ISU Catalog (Iowa State University Catalog: 2012-2013 Courses and Programs: http://catalog.iastate.edu/admissions/).

Undergraduate Admission Directly from High School

Admission decisions are made by admissions officers in accordance with the entrance requirements as set forth in the Iowa Administrative Code as well as the admission policies established by the Faculty Senate.

Students who seek admission must meet the following requirements and also any special requirements for the college or curriculum of their choice.

Applicants must submit an application for admission and the appropriate application fee (see www.admissions.iastate.edu for current application fee information). In addition, applicants must have their secondary school provide an official transcript of their academic record, including cumulative grade point average, rank in class, and certification of graduation.

Applicants must also arrange to have their ACT or SAT scores reported to Iowa State directly from the testing agency. US citizen and immigrant applicants who will not graduate from an approved US high school and whose primary language is not English must meet university communication proficiency requirements. This can be accomplished by achieving satisfactory scores on the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or the SAT. Contact the Office of Admissions for minimum score requirements for each examination.

Applicants may be required to submit additional information or data to support their applications.

A. Graduates of approved Iowa high schools who have the subject-matter background required by Iowa State University and who achieve a Regent Admission Index (RAI) score of at least 245 will be offered admission. Graduates of approved Iowa high schools who have the subject-matter background required by Iowa State University and who achieve less than a 245 RAI score will be considered for admission on an individual basis.

   The RAI score will be calculated for each applicant based on the following equation:
   RAI Score = (2 x ACT composite score)
   + (1 x percentile class rank)
   + (20 x high school GPA)
   + (5 x number of years of high school core courses completed)

Note: For purposes of calculating the RAI, SAT scores will be converted to ACT composite equivalents; high school rank is expressed as a percentile with 99% as the top value; high school GPA is expressed on a 4-point scale; and number of high school courses completed in the core subject areas is expressed in terms of years or fractions of years of study.

Applicants from high schools that do not present all four of the factors required for calculation of the RAI score will be considered for admission on an individual basis.

Those applicants who are not offered unconditional admission will either be given the opportunity to enroll for a trial period during the preceding summer session or be denied admission.

B. Nonresidents of Iowa, including international students, may be held to higher academic standards, but must meet at least the same requirements as resident applicants.

C. Applicants who are graduates of non-approved high schools will be considered for admission in a manner similar to applicants from approved high schools, but additional emphasis will be given to scores earned on standardized examinations.

D. Applications may be considered from students who did not graduate with their high school classes. They will be required to submit all academic data to the extent that it exists and achieve scores on standardized examinations which will demonstrate that they are adequately prepared for academic study.

E. Students with satisfactory academic records may be admitted, on an individual basis, for part-time university study while enrolled in high school or during the summers prior to high school graduation.

F. Exceptional students may be admitted as full-time students before completing high school. Early admission is provided to serve persons whose academic achievement and personal and intellectual maturity clearly suggest readiness for college-level study.

HIGH SCHOOL PREPARATION
Graduation from an approved high school shall ordinarily precede entrance into Iowa State University.

Students who wish to enter Iowa State University directly from high school (or transfer from another college or university with less than 24 semester hours of graded transferable college credit) must meet the level of academic performance described above and show evidence of the following high school preparation:

- English/Language Arts: Four years, emphasizing writing, speaking, and reading, as well as an understanding and appreciation of literature

- Mathematics: Three years, including one year each of algebra, geometry, and advanced algebra
- Science: Three years, including one year each of courses from two of the following fields: biology, chemistry, and physics
- Social Studies: Two years
- Students applying to the College of Engineering must have completed two years of a single foreign language.

Students who do not meet the high school course preparation requirements listed here, but who are otherwise well qualified, may be admitted after individual review of their applications.

Undergraduate Admission by Transfer from Other Educational Institutions
Students who seek admission must meet the following requirements and also any special requirements for the college and curriculum of their choice.

Applicants must submit an application for admission, and the appropriate application fee (see www.admissions.iastate.edu for current application fee information). Applicants must also request that each college they have attended send an official transcript of record to the Office of Admissions. Failure to provide transcripts from all colleges or universities attended may result in denial of the application or dismissal from the university. If less than 24 semester hours of graded transferable college credit is completed prior to entry at Iowa State University, applicants must also request that their official high school transcript and ACT or SAT scores be sent to the Office of Admissions. Other transfer applicants are encouraged to provide high school academic information. Students who do not do so may be asked to take course placement examinations during orientation.

US citizen and immigrant applicants who have not graduated from an approved US high school and whose primary language is not English must meet the university's English communication requirement. This can be accomplished by achieving satisfactory scores on the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS) or the SAT. Contact the Office of Admissions for minimum score requirements for each examination.

A. Transfer applicants with a minimum of 24 semester hours of graded transferable credit from regionally accredited colleges or universities, who have achieved for all college work previously attempted the grade point average required by Iowa State for specific programs, will be admitted. A 2.00 grade point average (on a 4.00 grading scale) is the minimum transfer grade point average requirement. Some programs may require a transfer grade point average higher than this minimum. Higher academic standards may be required of students who are not residents of Iowa, including international students.

Applicants who have not maintained the grade point average required by Iowa State University for specific programs or who are under academic suspension from the last college attended generally will be denied admission.

B. In addition to meeting the minimum transfer grade point average requirement described above, applicants who have completed fewer than 24 semester hours of graded transferable college credit prior to their enrollment at Iowa State must also meet the admission requirements for students entering directly from high school.

C. Transfer applicants under disciplinary suspension will not be considered for admission until information concerning the reason for the suspension has been received from the college assigning the suspension. Applicants granted admission under these circumstances will be admitted on probation.

D. Transfer applicants from colleges and universities not regionally accredited will be considered for admission on an individual basis, taking into account all available academic information.

B. Evaluating Student Performance

Evaluating Student Performance

The instructor in each course evaluates student performance by grading homework, quizzes, exams, reports, projects, presentations, and class participation. All but two required courses and technical electives in the program are taken for grade (A-F, plus/minus). The only exceptions are a library course (1 credit) and ENGR 101 *Orientation to Engineering* (R credit). Those two classes are graded on a pass/not-pass basis.

Monitoring Student Progress

The College of Engineering Academic Standards Committee is responsible for monitoring the academic progress of all undergraduate students in the college, based on policies and minimum requirements set by the Faculty Senate Committee on Academic Standards and Admissions and ratified by the Faculty Senate. The Committee is responsible for actions involving individual students with respect to placing students on academic probation, dismissing students from the university for unsatisfactory academic progress, and reinstating students who have been dismissed.

Students enrolled in the College of Engineering must satisfy all of the following requirements before enrolling in the professional courses (200-level and above) offered by departments in the Engineering College:

1. Completion of the Basic Program (Table 1-B.1) with a grade point average of 2.00 or better in the Basic Program courses.

2. A cumulative grade point average of 2.00 or better for all courses taken at Iowa State University.

3. The College of Engineering requires a grade of C or better for any transfer credit course that is applied to the Basic Program.

The following are the only exceptions to this rule:

a. Students who have completed all of their coursework while enrolled in the College of Engineering, but have not met the two basic program requirements, may enroll for not more than two semesters in 200-level or above courses offered by departments in the College of Engineering.

b. Students transferring to the College of Engineering from another college or university, or from a program outside this college, who have not met the two basic program requirements may also enroll for not more than two semesters in 200-level or above courses offered by departments in the College of Engineering. However, they may be granted an additional semester upon review by the college.

c. Iowa State students not pursuing an engineering degree may generally take engineering courses without restrictions provided they meet the prerequisites and space is available.

d. Only the first two semesters of 200-level and above engineering courses, taken at ISU while a student is not enrolled in the College of Engineering, can be applied toward an engineering degree.

Table 1-B.1: College of Engineering Basic Program (27 credits total).

Credits	Course(s)	Title(s)
4	Math 165	Calculus I
4	Math 166	Calculus II
3	Engl 150	Critical Thinking and Communication
3	Engl 250	Written, Oral, Visual and Electronic Composition
4	Chem 167 or 177	General Chemistry for Engineers or General Chemistry
3	Engr 160, AerE 160, CE 160, CprE 185, EE 185, SE 185, or IE 148	Engineering Problems with Computer Laboratory
5	Phys 221	Introduction to Classical Physics I
R	Engr 101	Engineering Orientation
1	Lib160	Library Instruction

Student progress is monitored through the degree audit system, overseen by advisors. For a complete description of the system, see Section F, Graduation Requirements.

Course prerequisites are listed in course descriptions, and ABE professional advising staff members advise students to avoid violating prerequisites. However, advisors do not have final jurisdiction on course selection, and the university course registration system does not

prevent registration based upon prerequisite deficiencies per se (other requirements, such as senior standing, are used to block registration in certain courses at the university). For these reasons, students can – and sometimes do – sign up for course without proper prerequisites. It is up to individual instructors to enforce prerequisites, by reminding student of needed prerequisites on the first day of class, and encouraging those who do not have them to drop the course or to meet with the instructor to evaluate their preparedness for the class.

C. Transfer Students and Transfer Courses

Transfer requirements are published in the ISU Catalog (Iowa State University Catalog: 2012-2013 Courses and Programs: http://catalog.iastate.edu/admissions/):

Iowa State University endorses the Joint Statement on Transfer and Award of Academic Credit approved by the American Council on Education (ACE) and the American Association of Collegiate Registrars and Admissions Officers (AACRAO). The current issue of Transfer Credit Practices of Designated Educational Institutions, published by AACRAO is an example of a reference used in determining transfer credit. The acceptance and use of transfer credit are subject to limitations in accordance with the educational policies of Iowa State University.

A. Students from regionally accredited colleges and universities. Credit earned at regionally accredited colleges and universities is acceptable for transfer, except for the following, which may not be accepted, or may be accepted to a limited extent:

- Credit in courses determined by Iowa State University to be of a developmental, vocational, or technical nature
- Credit in courses or programs in which the institution granting the credit is not directly involved.
- No more than 65 semester or 97 quarter credits earned at two-year colleges can be applied to a bachelors degree from Iowa State University. While there is no limit to the number of credits that may be transferred from a four-year institution, the last 32 semester credits must be completed at Iowa State University.

B. Students from colleges and universities which have candidate status. Credit earned at colleges and universities which have become candidates for accreditation by a regional association is acceptable for transfer in a manner similar to that from regionally accredited colleges and universities if the credit is applicable to the bachelor's degree at Iowa State University. Credit earned at the junior and senior classification from an accredited two-year college which has received approval by a regional accrediting association for change to a four-year college may be accepted by Iowa State University.

C. Students from colleges and universities not regionally accredited. When students are admitted from colleges and universities not regionally accredited, they may validate portions, or all, of their transfer credit by satisfactory academic study at Iowa State, or

by examination. The amount of transfer credit and the terms of the validation process will be specified at the time of admission. In determining the acceptability of transfer credit from private colleges in Iowa which do not have regional accreditation, the Regent Committee on Educational Relations, upon request from such institutions, evaluates the nature and standards of the academic program, faculty, student records, library, and laboratories. In determining the acceptability of transfer credit from colleges in states other than Iowa which are not regionally accredited, acceptance practices indicated in the current issue of Transfer Credit Practices of Designated Educational Institutions will be used as a guide. For institutions not listed in the publication, guidance is requested from the designated reporting institution of the appropriate state.

D. Students from foreign colleges and universities. Transfer credit from foreign educational institutions may be granted after a determination of the type of institution involved, its recognition by the educational authorities of the foreign country, and an evaluation of the content, level, and comparability of the study to courses and programs at Iowa State University. Credit may be granted in specific courses or assigned to general areas of study. Extensive use is made of professional journals and references which describe the educational systems and programs of individual countries.

Additional Transfer Credit Policies

A. Students with credit obtained during military service. Credit will be awarded for successful completion of technical or specialized schools attended while on active duty with the armed forces to the extent that the material is applicable toward degree requirements at Iowa State University. Application for such credit is made at the Office of Admissions, which follows many of the recommendations in the American Council on Education (ACE) publication A Guide to the Evaluation of Educational Experiences in the Armed Services.

B. Students with credit obtained through non-college sponsored instruction. Credit will be awarded for successful completion of learning acquired from participation in formal courses sponsored by associations, business, government, industry, and unions to the extent that the material is applicable toward degree requirements at Iowa State University. Application for such credit is made at the Office of Admissions, which follows many of the recommendations in the American Council on Education (ACE) publication The National Guide to Educational Credit for Training Programs.

C. Students with credit obtained through correspondence courses. Although Iowa State does not offer correspondence courses, college level courses taken by correspondence from accredited colleges or universities are acceptable for transfer at the undergraduate level if the courses taken are those that do not require laboratory study.

D. College Level Examination Program (CLEP). Iowa State University will award credit for each of the following 14 examinations: Financial Accounting, Principles of Accounting, American Government, Biology, Calculus, French Language,

Humanities, Principles of Macroeconomics, Principles of Microeconomics, Natural Sciences, Introductory Psychology, Social Sciences and History, Introductory Sociology, Spanish Language. Application of CLEP credit to a degree program varies with the department, so students should consult with their department before they register for CLEP examinations. Additional information is available at www.admissions.iastate.edu/cbe/cbe_clep.php.

E. Students with test-out credit. Students who have earned credit at other colleges or universities through Advanced Placement (AP), College Level Examination Program (CLEP), or International Baccalaureate (IB) examinations may qualify for credit at Iowa State University. Scores from these examinations should be sent directly to the Office of Admissions; credit will be awarded provided the scores satisfy Iowa State's requirements.

Credit earned at another college through locally designed test-out examinations may transfer to Iowa State University if accompanied by at least 12 transferable semester credits earned through coursework taken at that institution.

Articulation/Transfer Agreements (those that may apply to the program)

A. Career-technical credit from Iowa public community colleges. Iowa State University will accept up to 16 semester (24 quarter) credits earned in career-technical courses where the sending Iowa public community college will accept such courses toward its associate of arts or associate in science degree. Certain career-technical courses at Iowa community colleges may be articulated to Iowa State University as academic credit. The credit hours earned in these articulated courses would transfer in addition to the 16 semester hour career-technical maximum. Please refer to the course equivalency guides on the Web (www.admissions.iastate.edu/equiv) or contact the Office of Admissions for more information.

B. AP and CLEP credit from Iowa public colleges and universities. Iowa State University has an agreement with the Iowa public colleges and universities which allows credit earned through AP and CLEP examinations to transfer directly to Iowa State University if accompanied by at least 12 transferable semester credits earned through coursework taken at the sending institution.

C. There are no program-level articulations to report.

D. Advising and Career Guidance

Advising of A E program students is the responsibility of the ABE professional advising staff. Advising duties for the four undergraduate degree programs offered by ABE are covered by three professional advisors. Although the A E program advisor is backed up by the BSE program advisor, and vice-versa, the vast bulk of formal A E program advising is done by the primary advisor for the A E program. The initial advising for a student occurs during orientation visits for both direct admits and for transfer students. Students transferring in from other ISU departments typically are advised initially during the semester prior to their transfer. Subsequently, every student meets with their professional advisor once per

semester to get a registration password. These meetings are typically 30 minutes long, and focus on reviewing student degree audits, examining prerequisites, considering internships or study abroad opportunities, and graduation planning when appropriate.

In addition to the standard semester advising meetings, students in academic difficulty (as determined by GPA) are required to meet with their advisor during the first 10 days of the semester. ABE professional advising staff then follow up approximately four weeks into the semester to see how the first round of exams went – those who are in continuing trouble are referred to the ISU Academic Success Center for academic coaching or academic intervention.

Further support of student success is provided through Learning Communities – organized groups of underclass students who meet regularly with upper-class peer mentors, take core extra-departmental courses together, and form study groups. Learning communities are overseen by the Vice-chair of the ABE ECC, with strong programmatic assistance from the professional advisor for the A E program. Freshmen and sophomore students in the A E Learning Community can opt to live with other Learning Community students in a residence hall. These so-called Living Communities are extremely popular. The ABE department is one of the leaders in Learning Communities at Iowa State University, which has been at the forefront of this educational innovation.

Career guidance to all engineering students is accomplished through a partnership between the department and Engineering Career Services (ECS). Faculty and academic advisors work with ECS to develop career self-management skills in a variety of curricular and extra-curricular activities. Career advising begins the freshman year and continues through graduation.

On the curricular side, the A E 201 seminar class has significant emphasis on career skills development, and professional practicing engineers are regularly invited into the classroom to talk about career skills. The development of professional competencies, such as communication, teamwork, project management, initiative, continuous learning, and ethics in engineering are included in capstone and other design courses. As part of our college's continuous improvement processes, the student and supervisor assessment data from the experiential education program is analyzed to extract an understanding of the expectations for student outcomes and performance as practicing engineers.

On the extra-curricular side, ECS offers seminars and individual counseling to students on career topics and tools such as: self-marketing, leadership development, resume and interview preparation, job search strategies, career interest and skill matching, networking, and advanced communication skills. Additionally, leadership and project management development is a significant objective of student organization officer and learning community peer mentor training.

E. Work in Lieu of Courses

The ABE ECC has not allowed the awarding of course credit for work experiences, life experiences, or military experience. Credit for advanced placement, military training courses,

and other courses taken is provided per university guidelines detailed in Criterion 1 Section C above.

F. Graduation Requirements

The name of the degree awarded is Bachelor of Science in Agricultural Engineering.

The graduation requirements for the 128 credit hour[3] Power and Machinery option program can be summarized as follow: 10 credits of communication courses; 14 credits of mathematical sciences; 15 credit of physical sciences; 6 credits of biological/natural-resource sciences; 12 credits of social science and humanities; 6 credits of engineering; 34 credits of agricultural engineering; 10 credits of mechanical engineering; 3 credits of materials engineering; 13 credits of engineering mechanics, and 5 credits of technical electives. The Power and Machinery option therefore requires 65 credit hours of engineering topics.

The graduation requirements for the 128 credit hour[3] Agricultural and Environmental Systems Engineering option program can be summarized as follow: 10 credits of communication courses; 14 credits of mathematical sciences; 15 credit of physical sciences; 6 credits of agricultural and biological sciences; 12 credits of social science and humanities; 6 credits of engineering; 31 credits of agricultural engineering; 3 credits of mechanical engineering; 6 credits of civil engineering; 10 credits of engineering mechanics; and 12 credits of technical electives typically comprising a minimum of 6 additional engineering credits. The Agricultural and Environmental Systems Engineering option therefore requires 55 credit hours of engineering topics, and typically has students taking 61 – 67 credit hours of engineering topics due to additional engineering coverage in the technical electives.

The University requires all students to have at least a 2.00 GPA in order to graduate.

Graduation requirements are documented through an electronic degree audit. The degree audit is an individualized report that reflects a student's academic progress toward a specified degree. It compares the student's course work (both from ISU and transfer work from other institutions) with the academic degree program, and then prepares a report (the degree audit) which details the student's progress toward meeting the requirements of a specified degree. Degree audits can be accessed by students and their advisors, and their review is a critical part of the A E advising process for students, especially as graduation approaches. Degree requirements are reviewed by the Registrar after the first week of classes during the term the student intends to graduate. The student and adviser are notified of the student's graduation status – by midterm. If the degree audit shows no problems, a letter is forwarded to the student and adviser stating that upon satisfactory completion of the courses included on the current schedule, the academic requirements will be complete. If the degree audit needs further clarification and approval from the adviser and college office, a checklist will be forwarded to the student and adviser identifying the problem(s) that must be resolved in order for the student to meet the department's graduation requirements.

[3] All references to credits in this document are for **semester hours** of credit.

The academic advisor reviews the degree audit with the student as he/she progresses through the program to ensure that all requirements for graduation are being met. If there are any exceptions to the curriculum, they are reviewed by the advisor and must be approved by the ABE ECC; changes to the student's degree audit are submitted to the college classification office for processing on the student's degree audit. The University Graduation evaluator will review submitted applications for graduation and if any issues are identified these are shared with the college classification office. The college classification office then works with the student's advisor to address any remaining issues related to graduation.

G. Transcripts of Recent Graduates

To be provided during site visit.

CRITERION 2: PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statements

The mission of Iowa State University is to *create, share, and apply knowledge to make Iowa and the world a better place*[4]. [Note – the italicized text following is verbatim from published university mission.]

Iowa State University must prepare the leaders of our nation and the world. To make the world a better place, Iowa State will call upon its great strengths in student-centered education, global collaboration, and transformational basic and applied research. Iowa State will lead in developing more sustainable ways to produce and deliver safe and nutritious food, water, materials, and energy; integrate the protection of plant, animal, and human health; and care for our environment. We will design tools and infrastructure that will create entrepreneurial opportunities. The major changes sweeping the world are creating extraordinary opportunities for Iowa State to capitalize on its land-grant mission and be at the forefront in addressing our common, global challenges.

- *To create knowledge, Iowa State must be a magnet for attracting outstanding students, faculty, and staff who will learn, work, and conduct world-class research and scholarship that address the challenges of the 21st century.*

- *To share knowledge, Iowa State's faculty, staff, and students must be able to communicate with and learn from diverse populations. The University must maintain a strong focus on student success and provide exceptional undergraduate, graduate, professional, and outreach programs that prepare students and citizens for leadership and success.*

- *To apply knowledge, Iowa State's faculty, staff, and students must be able to develop global partnerships to convert what they know into products, services, and information that will improve the quality of life for the citizens of Iowa, the nation, and the world.*

The mission of the Iowa State University College of Engineering is as follows [italicized text is verbatim from the College's published mission[5]]:

"We are engineers who make a difference by:

- *Providing a high-quality, practical education that enables students to meet the grand challenges of the 21st-century.*

- *Conducting discipline-bridging, innovative research.*

[4] The Iowa State University Strategic Plan 2010-2015 can be found at http://www.provost.iastate.edu/sp/
[5] See http://www.engineering.iastate.edu/wp-content/blogs.dir/12/files/2011/08/ISU_CoE_StrategicPlan.pdf for the College of Engineering Strategic Plan 2011-2016

- *Collaborating broadly with corporations, government entities, educational institutions, and colleagues on campus.*

- *Fostering an environment of scholarship, diversity, and leadership among the students, faculty, and staff of the college."*

The mission of the Iowa State University Agricultural and Biosystems Engineering Department is as follows: *Promote undergraduate and graduate student learning in agricultural engineering, agricultural systems technology, and industrial technology; discover and improve new technologies for all stakeholders, and; provide engineering expertise in the fields of agriculture, biosystems and industry for the state, nation, and world.*

The mission of the Agricultural Engineering Degree Program is as follows: *Train students to integrate knowledge of physical and biological sciences through application of engineering fundamentals and design to systems involved in production, processing, storage, handling, distribution, and use of food, feed, fiber, and other biomaterials, and in management of related natural resources worldwide.*

B. Program Educational Objectives

The Program Educational Objectives (PEOs) of the Agricultural Engineering Degree program are:

> *Using the knowledge, skills, and abilities from their agricultural engineering degree, our graduates improve the human condition through successful careers in a wide variety of fields. They are effective leaders, collaborators, and innovators who address environmental, social, technical, and business challenges. They are engaged in life-long learning and professional development through self-study, continuing education, or graduate/professional school.*

These PEOs are publically declared on the ABE departmental website[6] under the *Accreditation* menu selection.[7] Included are concise descriptions of the accreditation strategies and continuous improvement processes for all four undergraduate degree programs.

To enable clarity in linking student outcomes to PEOs (Section 3-B, below), we defined five broad knowledge, skills, and abilities (KSAs) that must be attained by our graduates if they are to achieve our new PEOs. These KSAs are referred to in the first line of the PEOs, and represent in part a condensation of our former PEOs, thereby providing continuity between those detailed PEOs and the new, broad ones. Specifically, the KSAs are as shown in Table 2-B.1 below:

[6] http://www.abe.iastate.edu/
[7] http://www.abe.iastate.edu/accreditation

Table 2-B.1: Brief and detailed descriptors of the five key Knowledge, Skills, and Abilities provided by the A E degree.

Brief Descriptor	Detailed Descriptor
Analysis	Possess strong analysis skills
Design	Possess strong design skills
Broader Issues	Understand a range of issues relevant to engineering practice, including topics such as ethics, safety, professionalism, cultural diversity, globalization, and environmental impact
Lifelong Learning	Understand the importance of continuous professional and technical growth
Teaming	Capable of functioning in multidisciplinary and team oriented workplaces

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The PEO of improving the human condition grows directly out of the college and university missions to essentially improve the world by being good engineers. The university mission to meet key human needs (e.g., energy, water, and food) is completely congruent with the broad goals of the discipline of agricultural engineering. Finally, the university mission of applying knowledge and the college mission of fostering a scholarly environment both inform the PEO of life-long learning. For these reason, the PEO's are consistent with the institutional mission at multiple levels.

D. Program Constituencies

Constituencies for the Agricultural Engineering BS Program include private and governmental sector employers of our graduates, program graduates (i.e., alumni), current students in the program, graduate/professional schools where program graduates seek further education, and the citizens of Iowa. The first of these constituencies, employers, are well served by the PEO's emphasis on producing alumni who are effective leaders, collaborators, and innovators, because such alumni will contribute materially to the success of the employer. The PEO of life-long learning also serves employers as it makes for more motivated and capable employees. The second constituency, alumni themselves, are served by all the PEOs, both from a material standpoint (competent engineers displaying the qualities described in the PEOs are typically in high demand and command competitive salaries) and, more idealistically, from a deeper standpoint of the satisfaction that comes from genuinely contributing to society. Similarly, current students are served by the program being recognized as producing people who can become competent, successful engineers. Graduate program are also well served by programs that train innovative, collaborative engineers. The PEO link to professional schools (e.g., Law School, Medical School) is via the broad objectives of improving the human condition and addressing a wide variety of challenges. Finally, with over 70% of graduates going to work for companies in Iowa, the citizens of Iowa are extremely well served by having a steady stream of highly competent, successful engineers graduated from the local land-grant institution – these graduates effectively make Iowa more competitive in the global economy, thus helping build Iowa's future prosperity.

Employers and program graduates are formally represented by the ABE External Advisory Council (EAC); several employers are always also citizens of the state of Iowa, thus giving citizens an indirect representation on the EAC. Student representation on the ABE ECC provides a voice for current students in the program. Iowa State University graduate programs are indirectly represented in the ABE ECC because virtually all faculty members of the ABE ECC also direct graduate students; there is not a formal direct mechanism to include input from other graduate degree programs, or from medical, dental, or law schools in which some of our alumni matriculate. In development and validation of the program educational objectives, employers and alumni (via the EAC) are consulted to ensure the PEOs meet their needs. Through undergraduate representation on the ABE ECC, the undergraduate students also have a voice in determining PEOs.

E. Process for Revision of the Program Educational Objectives

Each year, the ABE ECC reviews the PEOs to determine their appropriateness and any need for change. Once every ABET cycle, the PEOs are reviewed by the EAC with the possibility of heavily revising them, and the alumni are surveyed about the appropriateness of the PEOs. In years 1 – 4 the PEO reviews resulted in no substantive changes. In years 5 and 6, the PEO review was formalized in the annual A E curriculum review process. The results of the curriculum review were communicated to the EAC during the fall EAC visit. Particular emphasis was given to the results of the PEO review, and the EAC rates the appropriateness of the PEOs so that we have continuous numerical data regarding the PEOs.

In 2011, ABET changed the expectations for PEOs, and the existing PEOs for the A E program did not appear to meet the new specification because they were not sufficiently broad. We immediately began work on revised PEOs that would serve the program's constituents and meet the ABET specification. In fall 2011, the revised PEOs were approved by the ABE ECC, then by the entire faculty, then shared with the EAC via e-mail, and then discussed in a conference call with the EAC membership. During that call, a few EAC members expressed their preference for a narrower set of PEOs – but other EAC members agreed with our stance that it was crucial that the PEOs be wide enough to capture the breadth of post-BS-degree activities in which our graduates participate. After discussion, the new PEOs were approved by the EAC. They were subsequently posted to the web, and have been used in departmental publications (including the catalog) since then.

CRITERION 3: STUDENT OUTCOMES

A. Student Outcomes

The Student Outcomes (SOs) of the Agricultural Engineering Degree Program are:

(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 within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary 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, economic, environmental, 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.

These SOs are publically declared on the ABE departmental website[8] under the *Accreditation* menu selection.[9] Included are concise descriptions of the accreditation strategies and continuous improvement processes for all four undergraduate degree programs.

B. Relationship of Student Outcomes to Program Educational Objectives

> *Using the knowledge, skills, and abilities from their agricultural engineering degree, our graduates improve the human condition through successful careers in a wide variety of fields. They are effective leaders, collaborators, and innovators who address environmental, social, technical, and business challenges. They are engaged in life-long learning and professional development through self-study, continuing education, or graduate/professional school.*

The A E PEOs (reproduced above, for convenience), are broader than their predecessors. In section 2-B (above), we explained how we defined five specific Knowledge, Skills, and Abilities (KSAs) that provide clarity in linking student outcomes to PEOs. Table 3-B.1 (below) maps these KSAs to Program Outcomes. An X in the table indicates that by accomplishing that outcome, the student has moved toward meeting the indicated program objective.

[8] http://www.abe.iastate.edu/
[9] http://www.abe.iastate.edu/accreditation

Table 3-B.1: Relationship of Knowledge, Skills, and Abilities (KSAs) to Program Educational Objectives. The KSAs underlie the broad PEOs, so that 3-B.1 links PEOs to Program Outcomes.[10]

Knowledge, Skills, and Abilities	Program Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
1) Analysis	X	X			X						X
2) Design	X	X	X		X		X		X	X	X
3) Broader Issues			X			X		X		X	
4) Lifelong Learning						X			X		
5) Teaming			X	X			X				

[10] Several of these KSAs are so broad that it would be possible to place an "X" in every single outcome area. We only do so when the outcome has an explicit component related to a specific KSA. Furthermore, we use the term *design* to mean the technical process of developing viable solutions to open-ended problems.

CRITERION 4: CONTINUOUS IMPROVEMENT

A. Program Educational Objectives

Obtaining *direct measures* of our graduates' achievement of the PEOs is challenging. Alumni are generally unwilling to ask their supervisors to rate their performance for examination by our program. We therefore use alumni self-surveys as the primary assessment instrument for evaluating PEO achievement. The PEO survey process is done every six years, approximately 18 months prior to the ABET visits. The office of the COE Director of Assessment collects and maintains the survey data. Raw survey results as well as summary statistics are provided to the departments. The ABE ECC includes the data and the resulting graphs illustrating attainment in the annual program review report for the year in which they were collected.

The survey instrument used in 2011 presented a list of actions informed by the PEO (items Q1 – Q11 below), and then asked respondents to indicate the degree to which they had executed those actions.

Q1. Demonstrated competence in methods of analysis involving use of mathematics, fundamental physical and biological sciences, engineering sciences, and computation needed for the practice of agricultural engineering.
Q2. Used skills necessary to the design process; including the abilities to think creatively, to formulate problem statements, to communicate effectively, to synthesize information, and to evaluate and implement problem solutions.
Q3. Addressed issues of ethics, safety, professionalism, cultural diversity, globalization, environmental impact, and social and economic impact in engineering practice.
Q4. Demonstrated continuous professional and technical growth, with practical experience, so as to be licensed as a professional engineer or achieve that level of expertise.
Q5. Demonstrated the ability to be a successful leader of multi-disciplinary teams
Q6. Demonstrated the ability to efficiently manage multiple simultaneous projects,
Q7. Demonstrated the ability to work collaboratively,
Q8. Demonstrated the ability to implement multi-disciplinary systems-based solutions,
Q9. Demonstrated the ability to apply innovative solutions to problems through the use of new methods or technologies,
Q10. Demonstrated the ability to contribute to the business success of your employer,
Q11. Demonstrated the ability to build community.

For each question, participants could select from six possible responses. The mapping of answer type to numerical score is shown in Table 4-A.1 below.

Table 4-A.1: Mapping of numerical scores to responses.

Accomplishments Response	Score Assigned
Very Well	100
Well	87.5
Adequately	75
Somewhat	65
Not At All	0
Not Applicable	No score assigned

The relationship between the PEOs and questions 1 – 11 is shown in Table 4-A.2 (below). To enable this mapping, we parsed the PEOs into five KSAs and four key achievements which are in the second sentence of the PEOs. (The third sentence of the PEOs is focused on life-long-learning, which is already represented in the KSA list.) Average scores from the relevant questions were used to compute the attainment of each PEO.

Table 4-A.2: Question Mapping to Program Educational Objectives. Each major part of the PEO is addressed by one or more questions in the 2011 survey. Average scores from the relevant questions were used to compute the attainment of each PEO.

PEO	Relevant Questions
KSA 1: Analysis	1
KSA 2: Design	2
KSA 3: Broader Issues	3
KSA 4: Lifelong Learning	4
KSA 5: Teaming	5, 7, 8, 11
Achievement 1: Successful Careers	6, 10
Achievement 2: Leaders	5
Achievement 3: Collaborators	7
Achievement 4: Innovators	9

It is our expectation that we are meeting our PEOs at least at an "Adequate" level. This implies average scores of 75 or better.

The results of the survey are shown below in Figure 4-A.1, and illustrate that the program is meeting its minimum threshold of "Adequately" achieving PEOs in all 9 areas into which the PEOs are subdivided. The ISU COE departments had survey response rates ranging from 11 to 25%. Although the A E program response rates were the highest on a % basis, our relatively small program (35 eligible graduates, 24 able to be contacted), meant that our absolute count was low (n = 6), and this is a concern to us. We are considering using social networking to better stay in contact with our graduates and to increase response rates on this key survey in the future.

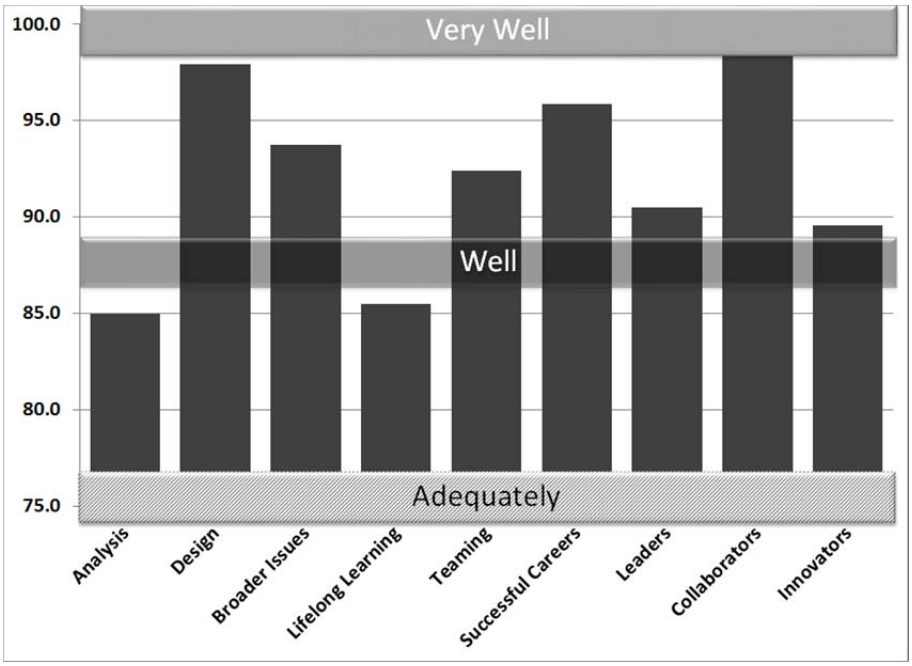

Figure 4-A.1: Alumni achievement of PEOs based on 2011 survey (n = 6), showing that all PEOs are met above our threshold level of "Adequately." Collaboration had the highest rating, and seven of the nine objectives were achieved at a level of "Well" or better.

B. Student Outcomes

The ABE ECC is the primary body responsible for the assessment process. As described in Background Part G, the formal process of this assessment is itself a work in progress. From 2011 onward, the major evaluation of assessment data takes place during a half-day ABE ECC retreat during the summer. In this annual program evaluation, all of the measures listed below are reviewed. Committee activity from the past year is also reviewed. Finally, a summary is written that includes:

- An overall assessment of student attainment of outcomes. We expect that overall our students will rate 85% attainment or better on each outcome. Where deficiencies are evident, and action plan will be developed and included.
- A summary of curricular improvements and key committee decisions/actions from the past year.
- An evaluation of the impacts of curricular improvements from preceding years.

This report is archived with ABE ECC materials, and a copy is sent to the ISU COE Director of Assessment.

The following measures are used in assessing student attainment of outcomes (a)-(k):

Co-op & internship evaluations

Approximately 80% of Agricultural Engineering students have had an internship, co-op, or career-relevant summer work experience by the time they graduate. The ISU COE implemented constituent-created, competency-based, ABET-aligned assessment tools for the engineering experiential education workplace, using Online Performance and Learning (OPAL™). OPAL™ is a competency development and performance management software created by Development Dimension International (www.ddiworld.com). Fourteen of the 15 identified ISU workplace competencies, which include elements like "analysis and judgment," "innovation," and "engineering knowledge", are mapped to student outcomes (a) – (k) through a matrix of weighting factors (the 15th competency, "safety awareness," is not mapped). Each competency is further broken into a series of key workplace actions that address that competency. This mapping is further detailed in Appendix E. The standard assessment survey through OPAL™ thus consists of the 61 Key Actions associated with the 15 ISU Competencies. To receive academic credit for a work term of co-op or internship, each student is required to complete the self-assessment and to make sure that the supervisor completed the same assessment of the student. Each supervisor provides an assessment of the student's demonstration of each Key Action in the workplace. Supervisors are asked to respond to this question for each of the Key Actions: "When given the opportunity, how often does the student perform the Key Action?" 5 – always or almost always, 4 – often, 3 – usually, 2 – sometimes, and 1 – never or almost never. This then allows us to use the weighting matrix to generate supervisor and student assessments of attainment of each of the outcomes. Five-year composite results are used, in order to ensure assessment is based on a sufficient number of responses.

Below is the OPAL co-op and intern evaluation data by student outcome. Supervisors, whose assessments are weighted more heavily than student self-assessment, indicate our students are above 85% attainment for each outcome.

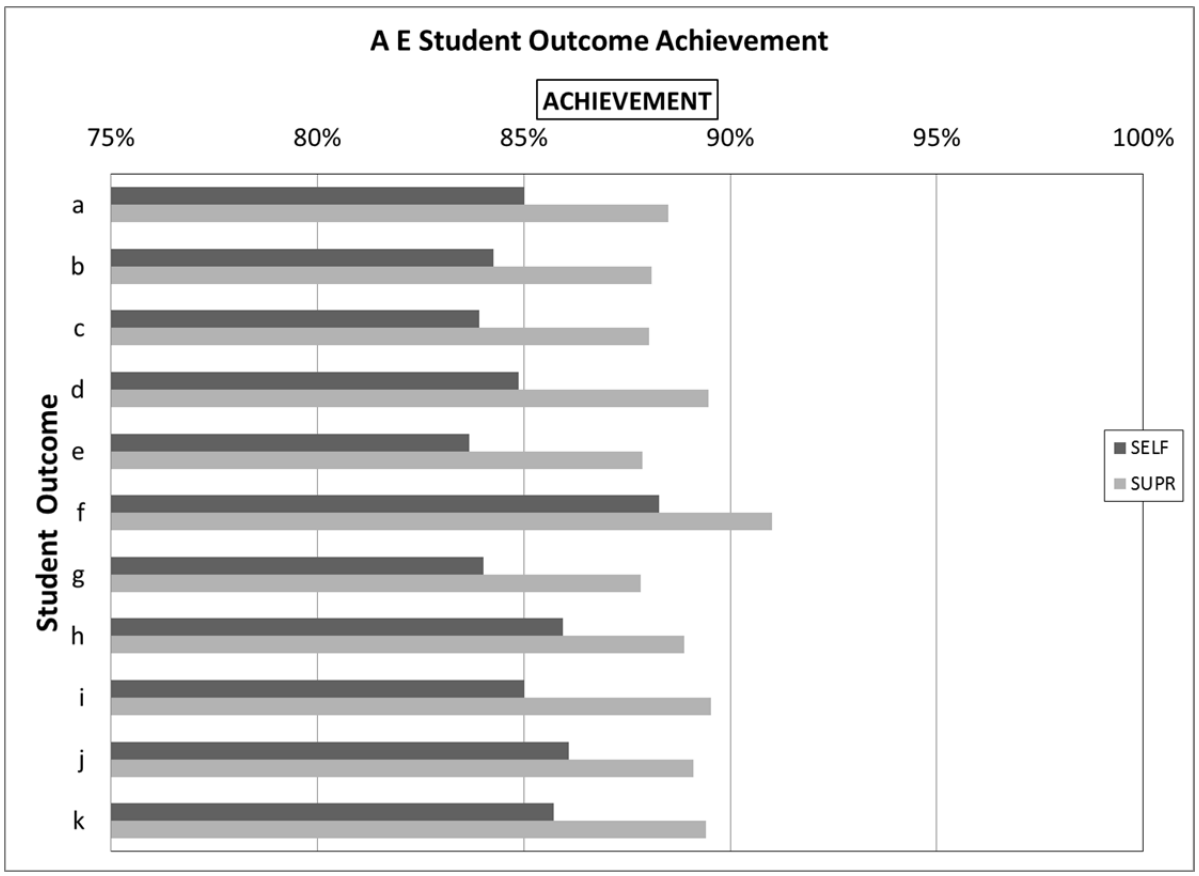

Figure 4-B.1: Intern achievement of Student Outcomes based on 2006 – 2011 surveys (employer n = 114, student n = 140), showing that all employers are rating students >85% on outcome achievement.

FE exam

During the past five years, approximately 65% of A E graduates have taken the Fundamentals of Engineering (FE) exam. We use five-year yearly and longitudinal FE exam results. Student outcomes addressed by this exam include (a) an ability to apply knowledge of mathematics, science, and engineering; (e) an ability to identify, formulate, and solve engineering problems; and (f) an understanding of professional and ethical responsibility.

Below is summary FE data for all ISU A E students (n=78) who took the exam from Spring 2006 through October 2010, compared to the national average for students in similar programs. FE data indicates we are at or above the national average across most content areas, and only slightly below in two others.

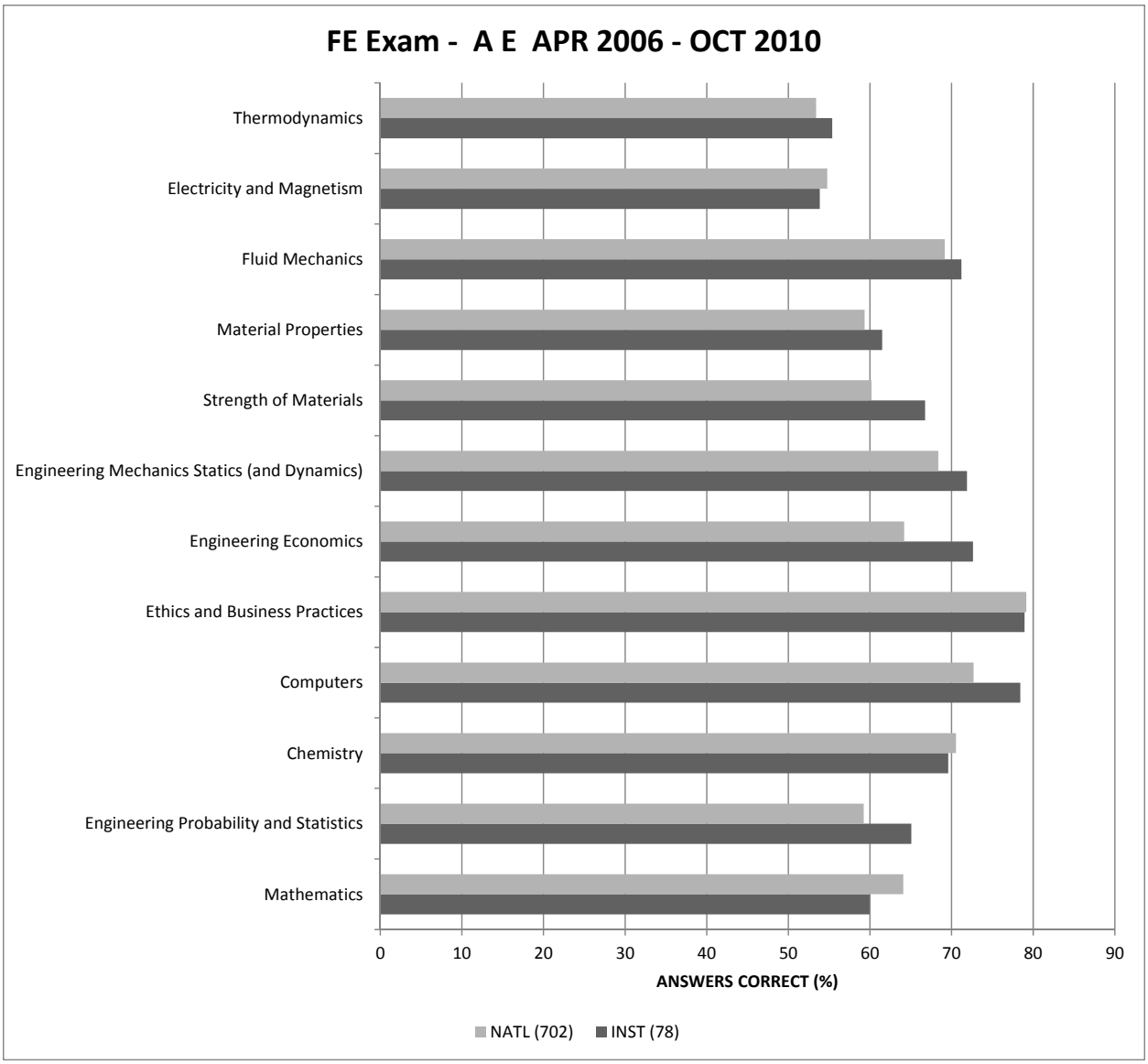

Figure 4-B.2: Performance of A E students on different areas of the Fundamentals of Engineering Exam, along with national averages.

Review of student work

We collect student work on key assignments in each A E class in the core curriculum. Specific outcomes addressed by each key assignment are identified by the instructor. The ABE ECC is then able to review student work outcome by outcome. Key assignments are collected every year.

From 2006 – 2011, as discussed in part G of the Background section of this report, we collected work through use of an electronic portfolio system that facilitated assessment by student competency, similar to OPAL. From 2011 onward, instructors save copies of all student work on each key assignment, and forward the copies to the ABE ECC for archival and eventual review.

Each example of student work is tagged with the outcomes addressed by that key assignment, as identified by the instructor. We then generate and review sets of student work grouped by outcome. Because of the significant time required to rigorously review student work for each outcome, pairs of faculty members on the ABE ECC are assigned to each outcome. Those pairs review the student work for their assigned outcomes, assess the level of attainment (on a 1 – 5 scale, per Table 4-B.1 below), and report back to the full committee at the annual program review. Results from the February 2012 process (involving 8 faculty members and reviewing multiple examples of 32 distinct graded key assignments) are presented in Figure 4-B.3 below.

Table 4-B.1: Mapping of numerical scores to responses.

Evidence Level of Outcome Attainment	Score Assigned
Excellent	5
Good	4
Moderate	3
Slight	2
None	1

This process fundamentally focuses on departmental core courses, and ignores completely learning in ABE electives, external electives, external required courses, and extracurricular activities. In the case of item "H" in the A E program, this causes a gap in an outcome which other measures (e.g., intern supervisor surveys as shown in Figure 4-B.1, above) clearly show are above 85% attainment. We accept this quirk in the outcome evaluation process because of its other benefits: namely a rigorous examination of the content in core disciplinary courses, and how work in those courses serves student outcomes.

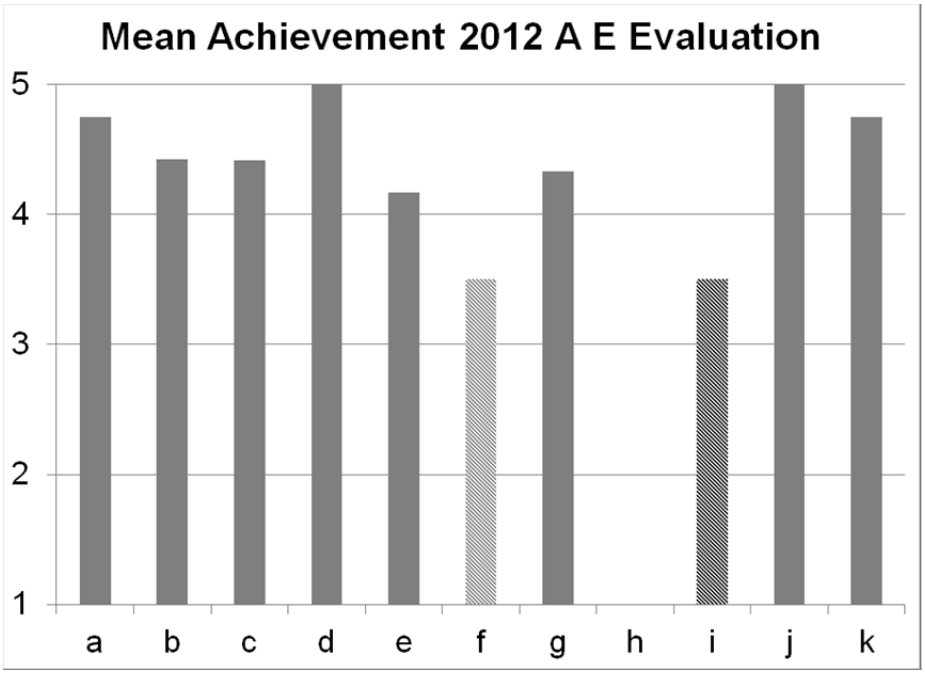

Figure 4-B.3: Average faculty ratings of achievement of student outcomes based on analysis of 32 distinct key-assignments that map to specific outcomes.

Also, from 2007-2009, the ABE ECC undertook an in-depth review of sample student work in core A E courses, based on a protocol outlined in Saunders et al. (2009). Briefly, the protocol involves the following steps: (1) The course instructor compiles two or three examples of representative, graded student work (for a single assignment), and a course syllabus. (2) The instructor comes to the ABE ECC meeting and briefly introduces the course and the assignment. (3) With the instructor silent, the ABE ECC members examine and discuss the student work, paying particular attention to how the work reflects the student outcomes. Once the committee has finished reviewing the work (typically after 15 minutes), the instructor is allowed to speak again to provide their insights into questions raised by the committee. Key observations resulting from this process are discussed in Section 4C.

Other Data that Inform our Curricular Improvement Process

All A E students are required to complete a capstone open-ended design project. This capstone is a two semester, two credit each semester experience. Students are required each semester to complete written and oral presentations that are evaluated by the course instructor using rubric assessment tools. The results are not directly mapped to student outcomes, but inform the continuous improvement process more generally. The ABE ECC also considers the written presentations in the *review of student work* process discussed above.

A E Seniors complete an anonymous electronic questionnaire (formerly WebCT, now Blackboard Learn) at some point during the last three weeks before graduation. This indirect assessment method has been in use for 10 years. The form is periodically reviewed and revised by the ABE ECC. The questionnaire includes information on job interviews, job offers, and jobs accepted, as well as on curriculum and instruction. Focus groups are also conducted to gather less structured qualitative feedback from willing graduating seniors. These data are reviewed annually. The results are not directly mapped to student outcomes, but inform the continuous improvement process more generally.

The Engineering Career Services (ECS) office provides program placement data each academic term. These data show placement of our A E students with industry, government agencies, and graduate schools. ECS also provides summary lists of employers of our graduates over the past several years. These data are reviewed annually. The results are not directly mapped to student outcomes, but inform the continuous improvement process more generally.

C. Continuous Improvement

Findings, Responses & Outcomes

As a result of the assessments described in section 4B, we have implemented several substantive changes to the A E curriculum. These are described below.

Finding: Students need more exposure to engineering ethics.

Outcomes Addressed: (f), (h)

Supporting Evidence: FE exam results showed lower than average scores from our students on the ethics portion. At the same time, OPAL data from supervisors and students alike consistently

rank "integrity" as the highest competency in terms of attainment. Thus, we believe that the low FE scores indicate a need to more rigorously cover the engineering code of ethics specifically, rather than professional ethics generally.

Response: Introduction to, and case studies covering, the Engineering Code of Ethics were added to the junior seminar, A E 301, and revisited in the senior seminar, A E 401. After the removal of these courses from the curriculum, the material was added to A E 415, the first course in the capstone design sequence, where it was already being covered to a lesser extent. As an added exposure, framed copies of the ASABE code of ethics were hung in several strategic locations in the hallways of our various facilities.

Outcome: The most recent review of FE data shows our students are performing at the national average in this content area.

Finding: Student performance in computational numerical methods is below expectation

Outcomes Addressed: (a), (e), (k)

Supporting Evidence: An ABE ECC review of student work in A E 203, and concurrent consultation with the course instructor, indicated many students entered the class with insufficient mathematical abilities to successfully meet the course objectives. In 2003, this course had been changed to a sophomore-level class with the intent of providing better continuity between some of the core A E courses. The result was that many students were enrolling in A E 203 without having already completed the course in differential equations. These students, then, did not understanding the fundamental calculus behind may of the numerical methods approaches covered in A E 203.

Response: In the Fall of 2009, A E 203 was changed back to a junior-level course, and renumbered A E 316 to reflect its continuity with A E 216 at the sophomore level. The course continuity issue that prompted the earlier move of this material to the sophomore year was addressed with the addition of a sophomore-level design course, discussed below.

Outcome: Feedback from students during exit interviews, and from the course instructor, has indicated this change has had positive effects.

Finding: Students struggle with open-ended engineering design

Outcomes Addressed: (a), (b), (c), (e)

Supporting Evidence: ABE ECC review of student work in major design courses, including the capstone 'senior design' sequence, indicated that students struggle with several key aspects of the design process, including: development of alternatives, development and utilization of constraints and criteria, and the integration of theory application with building and testing. Furthermore, OPAL supervisor assessments consistently indicate relative student weakness in the area of innovation – a key competency for the design-oriented outcomes listed above.

Response: We believe that there is a critical gap between the creative design experience of A E 170 (first year) and the structured design experiences of our 400-level courses. Further, we probably provide too little training in the design process itself. In order to reduce the 'design gap' and also provide an opportunity to walk the students through a full design process from problem statement to solution, we instituted curricular changes to add a 200-level project management and engineering design course (A E 218). A E 218 engages students seriously in key areas of open-ended design, including a three-week exposure to project management (and associate software), and multi-week open-ended design experience using technical content from A E 216 as well as project management software and final reporting. A E 301 and 401 (together 2 credits) were eliminated in part to allow room for the addition of A E 218.
Further, to elevate the perceived status of engineering design among our students, we implemented a 'Capstone Day' where senior design projects would be presented, to occur regularly on the Friday before the final week of classes. All faculty and students are encouraged to attend.

Outcome: A E 218 was implemented for the first time spring semester of 2012in Spring 2012. 'Capstone Day' was implemented Fall 2010, eliciting much higher attendance than in the past. We hope this will have a trickle-down effect to encourage students to meet our high expectations.

Finding: Students in the Agricultural and Environmental Systems option need more guidance in course selection.

Outcomes Addressed: (h), (j), (k). But we note that this deficiency not only impacts SO's, but PEO's also, because it effectively prevents otherwise capable engineers from achieving the PEO's due to a mismatch between their passion and their ability to find job placement.

Supporting Evidence: ABE ECC review of placement data indicated that despite departmental research strength in the area of water and the environment, few (possibly none) of our students get jobs in this area. Senior exit interviews/focus groups and anecdotal student feedback confirmed that students interested in this area are frustrated by a seeming inability to find work in that field.

Response: Students with a strong interest in water and the environment are routed through our AES option, which gives them the flexibility to choose coursework with a focus on natural resources or animal environment. We believe that this flexibility has inadvertently encouraged students to select courses in an ad hoc way that leaves them underprepared for the needs of employers in the water and environment area. Faculty connected to this theme area identified courses within the AES framework that would best prepare students for relevant employment.

Outcome: Course recommendations were posted to the departmental website in Spring 2011.

Future Actions: To further delineate appropriate and career-relevant course options for students, and in response to feedback from potential employers, starting with the 2013-14 catalog we will break the AES option into two distinct options: (1) Land and Water Resources Engineering, and

(2) Animal Production Systems Engineering. We have identified unique core coursework in each of these option areas.

In addition to these improvements, we have also made numerous lower-level changes to improve the quality of our program and the student experience in A E. These include such actions as changing seminar courses from full-semester courses meeting one hour per week to half-semester courses meeting two hours per week, allowing certain technical electives or course substitutions for individual students or select groups of students, and the addition of new upper-level elective courses.

D. Additional Information

To be provided during site visit.

CRITERION 5: CURRICULUM

1. Program Curricula

1. Table 5-1

The following pages have curricula for both options in the A E program.

Table 5-A.1: Curriculum for the 128 cr. A E Agricultural and Environmental Systems Engineering Option

Courses (Department, Number, Title) by term starting with first term of first year and ending with the last term of the final year	Required, Elective, Selected Elective[2]	*Curricular Area (Credit Hours)*				Last Two Terms Offered:	Average Section Enrollment[1]
		Math & Basic Sciences	Engineering Topics √ = Significant Design	General Education	Other		
First term of first year							
ENGR 101 Engineering Orientation	R	0	0	0	0	F2011, S2012	62
A E 170 Engineering Graphics and Introductory Design	R	0	3√	0	0	F2011, S2012	24
Math 165 Calculus I	R	4	0	0	0	F2011, S2012	300 (38)
Chem 167 + 167 L General Chemistry for Engineering Students + Lab	R	5	0	0	0	F2011, S2012	325 (14)
Engl 150 Critical Thinking and Communication	R	0	0	3	0	F2011, S2012	26
Lib 160 Library Instruction	R	0	0	0	1	F2011, S2012	60
Second term of first year							
A E 110 Experiencing Agricultural and Biosystems Engineering	R	0	1	0	0	S2011,S2012	24
ENGR 160 Engineering Problems with Computer Applications Lab	R	0	3	0	0	F2011, S2012	36
Math 166 Calculus II	R	4	0	0	0	F2011, S2012	300 (32)
Phys 221 Introduction to Classical Physics I	R	5	0	0	0	F2011, S2012	200 (28)
Econ 101 Principles of Microeconomics	SE	0	0	3	0	F2011, S2012	--
First term of second year							
EM 274 Statics of Engineering	R	0	3	0	0	F2011, S2012	80
Math 266 Differential Equations	R	3	0	0	0	F2011, S2012	38
Phys 222 Introduction to Classical Physics II	R	5	0	0	0	F2011, S2012	200 (36)
A E 216 Fundamentals of Agricultural and Biosystems Engineering	R	0	3	0	0	F2010, F2011	26
Biol 211 Principles of Biology I	R	3	0	0	0	F2011, S2012	299

Second term of second year							
A E 201 Entrepreneurship and Internship Seminar	R	0	0	0	1	F2011, S2012	72
Stat 305 Engineering Statistics	R	3	0	0	0	F2011, S2012	60
EM 324 + 327 Mechanics of Materials + Lab	R	0	4	0	0	F2011, S2012	90 (15)
ME 231 Thermodynamics	R	0	3	0	0	F2011, S2012	68
Engl 250 Written, Oral, Visual, and Electronic Composition	R	0	0	3	0	F2011, S2012	26
A E 218 Project Management and Design in Agricultural and Biosystems Engineering	R	0	2√	0	0	S2011, S2012	26
First term of third year							
A E 363 Agri-Industrial Applications of Electric Power and Electronics	R	0	4	0	0	F2010, F2011	28 (14)
A E 340 Functional Analysis and Design of Agricultural Field Machinery	SE	0	3	0	0	F2010, F2011	33 (16)
E M 378 Mechanics of Fluids	R	0	3	0	0	F2011, S2012	16
C E 332 Structural Analysis I	R	0	3	0	0	F2011, S2012	38
A E 316 Applied Numerical Methods for Agricultural and Biosystems Engineering	R	0	3	0	0	F2010, F2011	32 (16)
Second term of third year							
A E 271 Engineering Applications of Parametric Solid Modeling	SE	0	1	0	0	F2011, S2012	20 (10)
C E 372 Engineering Hydrology and Hydraulics	R	0	3	0	0	F2011, S2012	33
C E 326 Principles of Environmental Engineering	SE	0	0	0	3	F2011, S2012	--
Agron 154 Fundamentals of Soil Science	SE	3	0	0	0	F2011, S2012	--
Engl 314 Technical Communication	SE	0	0	3	0	F2011, S2012	26
Micro 201 Introduction to Microbiology	SE	0	0	0	2	F2011, S2012	--
First term of fourth year							
A E 404 Instrumentation for Agricultural and Biosystems Engineering	R	0	3√	0	0	F2010, F2011	31 (16)
A E 415 Agricultural Engineering Design I	R	0	2√	0	0	F2011, S2012	15
A E 431 Design and Evaluation of Soil and Water Conservation Systems	R	0	3√	0	0	F2010, F2011	14
A E 436 Design & Evaluation of Soil and Water Monitoring Systems	SE	0	0√	0	3	S2010, S2012	10
Psych 101 Introduction to Psychology	SE	0	0	3	0	F2011, S2012	--
HDFS 276 Human Sexuality	SE	0	0	3	0	F2011, S2012	--

Second term of fourth year							
A E 416 Agricultural Engineering Design II	R	0	2√	0	0	F2011, S2012	15
A E 472 Design of Environmental Systems for Agricultural Structures	R	0	3√	0	0	S2010, S2012	23
A E 532 Non-Point Pollution and Control	SE	0	0	0	3	S2009, S2011	10
M E 436 Heat Transfer	SE	0	0	0	4	F2011, S2012	--
Relig 205 Intro to World Religions	SE	0	0	3	0	F2011, S2012	--
TOTALS-ABET BASIC-LEVEL REQUIREMENTS							
OVERALL TOTAL CREDIT HOURS FOR THE DEGREE		35	55	21	17		
PERCENT OF TOTAL		27%	43%	16%	8%		
Total must satisfy either credit hours or percentage — Minimum Semester Credit Hours		32 Hours	48 Hours				
Total must satisfy either credit hours or percentage — Minimum Percentage		25%	37.5 %				

1. For courses that include multiple elements (lecture, laboratory, recitation, etc.), the first number is the average enrollment in lecture, and in parentheses is the average enrollment in lab or recitation sections.
2. Required courses are required of all students in the program, elective courses are optional for students, and selected electives are courses where students must take one or more courses from a specified group.

Table 5-A.2: Curriculum for the 128 cr. A E Power and Machinery Engineering Option

Courses (Department, Number, Title) by term starting with first term of first year and ending with the last term of the final year	Required, Elective, Selected Elective[2]	*Curricular Area (Credit Hours)*				Last Two Terms Offered:	Average Section Enrollment[1]
		Math & Basic Sciences	Engineering Topics √ = Significant Design	General Education	Other		
First term of first year							
ENGR 101 Engineering Orientation	R	0	0	0	0	F2011, S2012	62
A E 170 Engineering Graphics and Introductory Design	R	0	3√	0	0	F2011, S2012	24
Math 165 Calculus I	R	4	0	0	0	F2011, S2012	300 (38)
Chem 167 + 167 L General Chemistry for Engineering Students + Lab	R	5	0	0	0	F2011, S2012	325 (14)
Engl 150 Critical Thinking and Communication	R	0	0	3	0	F2011, S2012	26
Lib 160 Library Instruction	R	0	0	0	1	F2011, S2012	60
Second term of first year							
A E 110 Experiencing Agricultural and Biosystems Engineering	R	0	1	0	0	S2011,S2012	24
ENGR 160 Engineering Problems with Computer Applications Lab	R	0	3	0	0	F2011, S2012	36
Math 166 Calculus II	R	4	0	0	0	F2011, S2012	300 (32)
Phys 221 Introduction to Classical Physics I	R	5	0	0	0	F2011, S2012	200 (28)
Econ 101 Principles of Microeconomics	SE	0	0	3	0	F2011, S2012	--
First term of second year							
EM 274 Statics of Engineering	R	0	3	0	0	F2011, S2012	80
Mat E 273 Principles of Mat Science & Engr	R	0	3	0	0	F2011, S2012	211
Phys 222 Introduction to Classical Physics II	R	5	0	0	0	F2011, S2012	200 (36)
A E 216 Fundamentals of Agricultural and Biosystems Engineering	R	0	3	0	0	F2010, F2011	26
Agron 154 Fundamentals of Soil Science	R	3	0	0	0	F2011, S2012	16

Second term of second year							
A E 201 Entrepreneurship and Internship Seminar	R	0	0	0	1	F2011, S2012	72
Stat 305 Engineering Statistics	R	3	0	0	0	F2011, S2012	60
EM 324 + 327 Mechanics of Materials + Lab	R	0	4	0	0	F2011, S2012	90 (16)
Engl 250 Written, Oral, Visual, and Electronic Composition	R	0	0	3	0	F2011, S2012	26
A E 218 Project Management and Design in Agricultural and Biosystems Engineering	R	0	2√	0	0	S2011, S2012	26
Math 266 Differential Equations	R	3	0	0	0	F2011, S2012	38
First term of third year							
A E 363 Agri-Industrial Applications of Electric Power and Electronics	R	0	4	0	0	F2010, F2011	28 (14)
A E 340 Functional Analysis and Design of Agricultural Field Machinery	R	0	3	0	0	F2010, F2011	33 (16)
A E 316 Applied Numerical Methods for Agricultural and Biosystems Engineering	R	0	3	0	0	F2010, F2011	32 (16)
ME 231 Thermodynamics	R	0	3	0	0	F2011, S2012	68
EM 345 Dynamics	R	0	3	0	0	F2011, S2012	36
A E 271 Engineering Applications of Parametric Solid Modeling	SE	0	1	0	0	F2011, S2012	20 (10)
Second term of third year							
AE 342 Agricultural Tractor Power	R	0	3√	0	0	S2011, S2012	38 (19)
ME 324 Manufacturing Engineering	R	0	4	0	0	F2011, S2012	122 (18)
E M 378 Mechanics of Fluids	R	0	3	0	0	F2011, S2012	16
Biol 211 Principles of Biology I	R	3	0	0	0	F2011, S2012	299
Engl 314 Technical Communication	SE	0	0	3	0	F2011, S2012	26
First term of fourth year							
A E 404 Instrumentation for Agricultural and Biosystems Engineering	R	0	3√	0	0	F2010, F2011	31 (16)
A E 415 Agricultural Engineering Design I	R	0	2√	0	0	F2011, S2012	15
A E 413 Fluid Power Engineering	R	0	3√	0	0	F2010, F2011	40 (13)
ME 325 Machine Design	R	0	3	0	0	F2011, S2012	140
Psych 101 Introduction to Psychology	SE	0	0	3	0	F2011, S2012	--
HDFS 276 Human Sexuality	SE	0	0	3	0	F2011, S2012	--

Second term of fourth year							
A E 416 Agricultural Engineering Design II	R	0	2√	0	0	F2011, S2012	15
A E 472 Design of Environmental Systems for Agricultural Structures	R	0	3√	0	0	S2010, S2012	23
Agron 354/354L Soils and Plant Growth/Laboratory	SE	0	0	0	4	F2011, S2012	--
AE 272 Parametric Solid Models, Drawings, Assemblies using Pro/E	SE	0	0	0	1	F2011, S2012	20 (10)
Relig 205 Intro to World Religions	SE	0	0	3	0	F2011, S2012	--
TOTALS-ABET BASIC-LEVEL REQUIREMENTS							
OVERALL TOTAL CREDIT HOURS FOR THE DEGREE		35	65	21	7		
PERCENT OF TOTAL		27%	51%	16%	5%		
Total must satisfy either credit hours or percentage	Minimum Semester Credit Hours	32 Hours	48 Hours				
	Minimum Percentage	25%	37.5 %				

1. For courses that include multiple elements (lecture, laboratory, recitation, etc.), the first number is the average enrollment in lecture, and in parentheses is the average enrollment in lab or recitation sections. Enrollment data is reported for all elective courses, because class size is dependent upon the course the student selects.
2. Required courses are required of all students in the program, elective courses are optional for students, and selected electives are courses where students must take one or more courses from a specified group

2. Curricular Mappings to PEOs

As described earlier, five broad knowledge, skills, and abilities (KSAs) enable graduates to achieve our PEOs: 1) Possess strong analysis skills; 2) Possess strong design skills; 3) Understand a range of issues relevant to engineering practice, including topics such as ethics, safety, professionalism, cultural diversity, globalization, and environmental impact; 4) Understand the importance of continuous professional and technical growth; 5) Be capable of functioning in multidisciplinary and team oriented workplaces. Tables 5-B.1 and 5-B.2 below indicate how the curriculum, on a course-by-course basis, aligns with these KSAs. An "X" in the table indicates that by successfully taking that course, the student has moved toward meeting the indicated program objective.

Table 5-B.1: Curriculum Mapping to Broad Knowledge, Skills, and Abilities (KSA) Areas Required to Meet Program Educational Objectives (PEOs) for the 128 cr. Agricultural and Environmental Systems Engineering Option. KSA brief descriptors are: 1) Analysis; 2) Design; 3) Broader Issues; 4) Lifelong Learning; 5) Teaming.

Course	KSA				
	1	2	3	4	5
ENGR 101 Engineering Orientation			X		X
A E 170 Engineering Graphics and Introductory Design		X			X
Math 165 Calculus I	X				
Chem 167 + 167 L General Chemistry for Engineering Students + Lab	X				
Engl 150 Critical Thinking and Communication			X	X	
Lib 160 Library Instruction				X	
A E 110 Experiencing Agricultural and Biosystems Engineering				X	X
ENGR 160 Engineering Problems with Computer Applications Lab	X				
Math 166 Calculus II	X				
Phys 221 Introduction to Classical Physics I	X				
SSH Elective			X		
EM 274 Statics of Engineering	X	X			
Math 266 Differential Equations	X				
Phys 222 Introduction to Classical Physics II	X				
A E 216 Fundamentals of Agricultural and Biosystems Engineering	X	X			
Biol 211 Principles of Biology I	X				
A E 201 Entrepreneurship and Internship Seminar			X	X	
Stat 305 Engineering Statistics	X				
EM 324 + 327 Mechanics of Materials + Lab	X	X			
ME 231 Thermodynamics	X	X			
Engl 250 Written, Oral, Visual, and Electronic Composition			X	X	
A E 218 Project Management and Design in Agricultural and Biosystems Engineering	X	X	X		X
A E 363 Agri-Industrial Applications of Electric Power and Electronics	X	X			
A E Elective	X	X			
E M 378 Mechanics of Fluids	X	X			
C E 332 Structural Analysis I	X	X			
A E 316 Applied Numerical Methods for Agricultural and Biosystems Engineering	X	X			

A E Modeling Elective	X	X			
C E 372 Engineering Hydrology and Hydraulics	X	X			
C E 326 Principles of Environmental Engineering	X	X			
Bio/Ag Elective	X	X			
Communication Elective			X	X	
Technical Elective	X				
A E 404 Instrumentation for Agricultural and Biosystems Engineering	X	X		X	
A E 415 Agricultural Engineering Design I	X	X	X	X	X
A E 431 Design and Evaluation of Soil and Water Conservation Systems	X	X			
Technical Elective	X	X			
SSH Elective			X		
US Diversity			X		
A E 416 Agricultural Engineering Design II	X	X	X	X	X
A E 472 Design of Environmental Systems for Agricultural Structures	X	X			
Technical Elective	X	X			
International Perspectives			X		

Table 5-B.2: Curriculum Mapping to Broad Knowledge, Skills, and Abilities (KSA) Areas Required to Meet Program Educational Objectives (PEOs) for the 128 cr. Power and Machinery Engineering Option. KSA brief descriptors are: 1) Analysis; 2) Design; 3) Broader Issues; 4) Lifelong Learning; 5) Teaming.

Course	KSA				
	1	2	3	4	5
ENGR 101 Engineering Orientation			X		X
A E 170 Engineering Graphics and Introductory Design		X			X
Math 165 Calculus I	X				
Chem 167 + 167 L General Chemistry for Engineering Students + Lab	X				
Engl 150 Critical Thinking and Communication			X	X	
Lib 160 Library Instruction				X	
A E 110 Experiencing Agricultural and Biosystems Engineering				X	X
ENGR 160 Engineering Problems with Computer Applications Lab	X				
Math 166 Calculus II	X				
Phys 221 Introduction to Classical Physics I	X				
SSH Elective			X		
EM 274 Statics of Engineering	X	X			
Mat E 273 Principles of Mat Science & Engr	X				
Phys 222 Introduction to Classical Physics II	X				
A E 216 Fundamentals of Agricultural and Biosystems Engineering	X	X			
Agron 154 Fundamentals of Soil Science	X				

A E 201 Entrepreneurship and Internship Seminar			X	X	
Stat 305 Engineering Statistics	X				
EM 324 + 327 Mechanics of Materials + Lab	X	X			
Engl 250 Written, Oral, Visual, and Electronic Composition			X	X	
A E 218 Project Management and Design in Agricultural and Biosystems Engineering	X	X		X	X
Math 266 Differential Equations	X				
A E 363 Agri-Industrial Applications of Electric Power and Electronics	X	X			
A E 340 Functional Analysis and Design of Agricultural Field Machinery	X	X			
A E 316 Applied Numerical Methods for Agricultural and Biosystems Engineering	X	X			
ME 231 Thermodynamics	X	X			
EM 345 Dynamics	X	X			
A E Modeling Elective	X				
AE 342 Agricultural Tractor Power	X	X			
ME 324 Manufacturing Engineering	X	X			
E M 378 Mechanics of Fluids	X	X			
Biol 211 Principles of Biology I	X				
Communication Elective			X	X	
A E 404 Instrumentation for Agricultural and Biosystems Engineering	X	X		X	
A E 415 Agricultural Engineering Design I	X	X	X	X	X
A E 413 Fluid Power Engineering	X	X			
ME 325 Machine Design	X	X			
SSH Elective			X		
US Diversity Elective			X		
A E 416 Agricultural Engineering Design II	X	X	X	X	X
A E Elective	X	X			
Technical Elective	X				
International Perspectives Elective			X		

3 & 4. Curricular Mappings to Student Outcomes and Prerequisite Structure

Recalling that the student outcomes are a – k, Tables 5-C.1 and 5-C.2 (below) indicate how the curriculum, on a course-by-course basis, supports the attainment of student outcomes. An "X" in the table indicates that by successfully taking that course, the student has learned material that is directly relevant to the attainment of the specified student outcome. Tables 5-C.1 and 2 also delineate the prerequisite structure for these courses.

Table 5-C.1: Curriculum Mapping to Student Outcomes for the 128 cr. Agricultural and Environmental Systems Engineering Option.

No.	Course	Pre/Co Requisites	Student Outcome										
			a	b	c	d	e	f	g	h	i	j	k
1.1	ENGR 101 Engineering Orientation										X		
1.2	A E 170 Engineering Graphics and Introductory Design		X										X
1.3	Math 165 Calculus I		X										
1.4	Chem 167 + 167 L General Chemistry for Engineering Students + Lab		X	X					X				
1.5	Engl 150 Critical Thinking and Communication								X	X			
1.6	Lib 160 Library Instruction										X		
2.1	A E 110 Experiencing Agricultural and Biosystems Engineering					X			X			X	
2.2	ENGR 160 Engineering Problems with Computer Applications Lab		X				X		X				X
2.3	Math 166 Calculus II	1.3	X										
2.4	Phys 221 Introduction to Classical Physics I	2.3	X	X					X				
2.5	SSH Elective									X		X	
3.1	EM 274 Statics of Engineering	2.3, 2.4	X				X		X				
3.2	Math 266 Differential Equations	2.3	X										
3.3	Phys 222 Introduction to Classical Physics II	2.3, 2.4	X										
3.4	A E 216 Fundamentals of Agricultural and Biosystems Engineering	2.1, 2.2, 2.3	X	X			X						
3.5	Biol 211 Principles of Biology I	1.4	X										
4.1	A E 201 Entrepreneurship and Internship Seminar							X	X	X	X		
4.2	Stat 305 Engineering Statistics	1.3	X										
4.3	EM 324 + 327 Mechanics of Materials + Lab	3.1	X	X									
4.4	ME 231 Thermodynamics	1.4, 3.3	X										
4.5	Engl 250 Written, Oral, Visual, and Electronic Composition	1.5, 1.6							X	X	X		
4.6	A E 218 Project Management and Design in Agricultural and Biosystems Engineering	3.4		X	X	X	X		X				X
5.1	A E 363 Agri-Industrial Applications of Electric Power and Electronics	3.3	X	X	X	X	X	X					X
5.2	A E Elective	var					X						
5.3	E M 378 Mechanics of Fluids	3.1	X				X						
5.4	C E 332 Structural Analysis I	4.3	X				X						
5.5	A E 316 Applied Numerical Methods for Agricultural and Biosystems Engineering	2.2, 3.2	X				X						X
6.1	A E Modeling Elective	1.2											X
6.2	C E 372 Engineering Hydrology and Hydraulics	5.3, 1.3	X				X						
6.4	Bio/Ag Elective		X										
6.5	Communication Elective	Var							X				
6.6	Technical Elective	Var											

7.1	A E 404 Instrumentation for Agricultural and Biosystems Engineering	5.1	X	X	X		X						X
7.2	A E 415 Agricultural Engineering Design I	6.1, 4.3		X	X	X	X	X	X				X
7.3	A E 431 Design and Evaluation of Soil and Water Conservation Systems	5.3	X	X			X	X				X	X
7.4	Technical Elective	Var											
7.5	SSH Elective									X	X		
7.6	US Diversity									X	X		
8.1	A E 416 Agricultural Engineering Design II	7.2		X	X	X	X	X	X				X
8.2	A E 472 Design of Environmental Systems for Agricultural Structures	3.4, 4.4	X	X	X		X						X
8.3	Technical Elective	Var											
8.5	International Perspectives									X	X		

Table 5-C.2: Curriculum Mapping to Student Outcomes for the 128 cr. Power and Machinery Engineering Option.

No.	Course	Pre/Co Requisites	Student Outcome										
			a	b	c	d	e	f	g	h	i	j	k
1.1	ENGR 101 Engineering Orientation										X		
1.2	A E 170 Engineering Graphics and Introductory Design		X										X
1.3	Math 165 Calculus I		X										
1.4	Chem 167 + 167 L General Chemistry for Engineering Students + Lab		X	X					X				
1.5	Engl 150 Critical Thinking and Communication								X	X			
1.6	Lib 160 Library Instruction										X		
2.1	A E 110 Experiencing Agricultural and Biosystems Engineering					X			X			X	
2.2	ENGR 160 Engineering Problems with Computer Applications Lab		X				X		X				X
2.3	Math 166 Calculus II	1.3	X										
2.4	Phys 221 Introduction to Classical Physics I	2.3	X	X					X				
2.5	SSH Elective									X		X	
3.1	EM 274 Statics of Engineering	2.3, 2.4	X				X		X				
3.2	Mat E 273 Principles of Mat Science & Engr	1.3, 1.4	X				X						
3.3	Phys 222 Introduction to Classical Physics II	2.3, 2.4	X										
3.4	A E 216 Fundamentals of Agricultural and Biosystems Engineering	2.1, 2.2, 2.3	X	X			X						
3.5	Agron 154 Fundamentals of Soil Science		X										
4.1	A E 201 Entrepreneurship and Internship Seminar							X	X	X	X		
4.2	Stat 305 Engineering Statistics	1.3	X										
4.3	EM 324 + 327 Mechanics of Materials + Lab	1.3	X	X									
4.4	Engl 250 Written, Oral, Visual, and Electronic Composition	1.5, 1.6							X	X	X		
4.5	A E 218 Project Management and Design in Agricultural and Biosystems Engineering	3.4		X	X	X	X		X				X
4.6	Math 266 Differential Equations	2.3	X										

5.1	A E 363 Agri-Industrial Applications of Electric Power and Electronics	3.3	X	X	X	X	X	X					X
5.2	A E 340 Functional Analysis and Design of Agricultural Field Machinery	2.1, 3.4, 5.3	X				X						
5.3	A E 316 Applied Numerical Methods for Agricultural and Biosystems Engineering	2.2, 2.3	X				X						X
5.4	ME 231 Thermodynamics	1.4, 3.3	X				X						
5.5	EM 345 Dynamics	3.1, 4.6	X				X						
5.6	A E Modeling Elective	1.2											X
6.1	AE 342 Agricultural Tractor Power	5..4	X				X						
6.2	ME 324 Manufacturing Engineering	4.5, 4.3, 3.2											
6.3	E M 378 Mechanics of Fluids	3.1	X				X						
6.4	Biol 211 Principles of Biology I	1.4	X										
6.5	Communication Elective	Var							X				
7.2	A E 404 Instrumentation for Agricultural and Biosystems Engineering	5.1	X	X	X		X						X
7.3	A E 415 Agricultural Engineering Design I	5.6, 4.3		X	X	X	X	X	X				X
7.4	A E 413 Fluid Power Engineering	6.3, 3.4	X	X			X						X
7.5	ME 325 Machine Design	5.4, 5.5, 4.6	X				X						
7.6	SSH Elective									X	X		
8.1	US Diversity Elective									X	X		
8.2	A E 416 Agricultural Engineering Design II	7.3		X	X	X	X	X	X				X
8.3	A E Elective	Var					X						
8.4	International Perspectives Elective									X	X		
8.5	Technical Elective	Var											

5. Hours and Depth of Study

The A E program has a minimum Math and Basic Sciences content of 35 semester hours (27% of credits), exceeding the 32 h (and 25%) minimums in this area. The program has a minimum Engineering Topics content of 55 semester hours (43% of credits), exceeding the 48 h (and 37.5%) minimums in this area. The A E program criteria are as follow: (1**)** The curriculum must include mathematics through differential equations and biological and engineering sciences consistent with the program educational objectives. The curriculum must prepare graduates to apply engineering to agriculture, aquaculture, forestry, human, or natural resources. (2) The program shall demonstrate that those faculty members teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of education and experience or professional licensure.

Regarding program criterion 1, math through differential is required (per Table 5-A.1 and 2), and biological and engineering sciences are similarly required. Regarding program criterion 2, the primary instructor of the capstone course for the past decade has been a PE (J. Harmon), and other associated instructors (e.g., R. P. Anex and A. Bhandari) have been either PEs (Bhandari) or have had extensive professional practice experiences (Anex).

6. Design Experiences

All AE students are required to complete a two-semester capstone design project, involving an open-ended design problem. As shown in Tables 5-A.1 and 5-A.2, each of the two courses is 2

cr., for a total of 4 cr. Each semester, students complete written and oral presentations that are evaluated by the course instructor and other visiting instructors using rubric assessment tools. To achieve the highest ranking on the rubric, the reports must achieve the qualities shown in Table 5-D.1 below. The breadth of projects is a hallmark and challenge of the program. Recent projects range from new machinery implement designs to a solar fruit dryers for a developing country to an algal scrubber for tile drainage. Successful design teams must leverage technical content from prior coursework such as mechanics of materials, instrumentation, or heat and mass transfer.

Table 5-D.1: Capstone Design Rubric descriptions for highest possible scores.

REPORT FEATURES	
Professional appearance **(5 pts)**	Professional quality, bound report, well formatted sections and subsections, professional quality figures and tables. Appropriate use of fonts and/or color. Professional cover letter included.
Executive summary/conclusions **(5 pts)**	Professional, well-written, includes all critical information for a quick overview of the design project.
Design brief, problem definition and objectives **(5 pts)**	User and/or client clearly described. Design brief clearly and concisely articulated. Project background is well researched, relevant theory, other past and present approaches to solve the problem correctly and completely described. Appropriate references cited and clearly listed in a bibliography. All project objectives clearly and correctly outlined.
Design criteria and constraints **(5 pts)**	All design criteria and design constraints have been identified and clearly and correctly articulated. Current and future states are accurately described.
Identification of global and functional alternatives **(5 pts)**	All possible global/functional alternatives are clearly articulated and presented using well-accepted approaches and tools. All alternative solutions and/or approaches are described with sufficient detail.
Evaluation of alternatives **(5 pts)**	A well-accepted, quantitative process is utilized to evaluate all global and functional alternatives. Pros and cons of each alternative are clearly and correctly articulated, compared and ranked. All rationale for selection is clearly described.
Design, prototyping, and testing **(30 pts)**	The design process and design steps are clearly articulated with a design summary. All supporting design calculations are recorded in an appendix. Where appropriate and necessary, prototyping is clearly described and well-documented. Testing data are correctly and completely analyzed.

7. Cooperative Education

The program allows and encourages cooperative education, but does not use cooperative education to satisfy curricular requirements.

8. Materials to be Provided

We will provide course syllabi, textbooks, sample student work (including design projects) during the site visit to demonstrate achievement related to this criterion.

2. Course Syllabi

Please see Appendix A for a listing of the syllabus of each course used to satisfy the mathematics, science, discipline-specific requirements of Criterion 5, along those relevant to applicable program criteria.

CRITERION 6: FACULTY

A. Faculty Qualifications

The department is composed of 26 tenured (or tenure-track) faculty members all of whom hold multiple degrees in engineering (primarily in agricultural, biological, or like-named disciplines), and three non-tenure-track faculty members (one Extension Engineer, one Adjunct Assistant Professor, one Lecturer). Five tenured faculty members hold Professional Engineers licenses, and two of the non-tenure-track faculty members are also PEs. All faculty members are associated with one of five major focus areas, although several faculty members straddle more than one area. There is significant faculty expertise in the Advanced Machinery Engineering and Manufacturing Systems focus group, whose members teach the bulk the discipline-specific coursework for the Power and Machinery Systems Option, and in the Water and Environmental Stewardship focus group and the Animal Production Systems Engineering focus group, whose members teach the bulk of the discipline-specific coursework for the Agricultural and Environmental Systems Engineering Option. Faculty in the Biological and Process Engineering focus group teach several core courses taken by students in both options (e.g., A E 363, ENGR 160), while faculty in the Occupational Safety Engineering focus group are playing a leading role in current departmental and college level efforts to improve lab/shop safety. Faculty experience is high – totaling over 100 person-years of industrial experience and over 400 person-years of faculty (teaching) experience. Table 6-1 summarizes faculty credentials and experience, and Appendix B contains 2-pg. resumes of all faculty members.

Table 6-1. Faculty Qualifications

Agricultural Engineering

Faculty Name	Highest Degree Earned-Field and Year	Rank [1]	Type of Academic Appointment [2]	FT or PT [3]	Years of Experience			Professional Registration/ Certification	Level of Activity [4] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
1. Bern, Carl	Ph.D. AgE 1973	P	T	PT	4	49	45	PE (IA)	L	L	M
2. Birrell, Stuart	Ph.D. AgE 1995	ASC	T	FT	0	20	14		H	M	H
3. Brumm, Thomas	Ph.D. AgE 1990	ASC	T	FT	4	12	12	EIT	M	M	L
4. Darr, Matthew	Ph.D. Ag&BE 2007	AST	TT	FT	5	4	4		H	M	H
5. Freeman, Steven	Ph.D. AgE 1993	P	T	FT		16	15	CSP, CSTM, EIT	H	M	L
6. Glanville, Thomas	Ph.D. Civil Eng. 1987	P	T	PT	5	35	38		L	M	M
7. Grewell, David	Ph.D. Welding Eng. 2005	ASC	T	FT	4	7	7		H	H	H
8. Hanna, H. Mark	Ph.D. AgE 1991	O	NTT	FT	14	2	39	PE (NE & IA)	M	M	M
9. Harmon, Jay	Ph.D. AgE 1989	P	T	FT	4	23	19	PE	H	H	H
10. Helmers, Matthew	Ph.D. Ag&BE 2003	ASC	T	FT	2	0	9	EIT	H	H	H
11. Hoff, Steven	Ph.D. AgE 1990	P	T	FT	5	22	22	PE (IA)	H	M	H
12. Hurburgh, Charles	Ph.D. AgE 1981	P	T	FT	4	18	36		H	H	H
13. Kaleita, Amy	Ph.D. AgE 2003	ASC	T	FT	5	9	9	EIT	M	H	L
14. Kanwar, Ramesh	Ph.D. AgE 1981	P	T	PT		43	36	Prof. Hydrol.	H	H	M
15. Keren, Nir	Ph.D. Interd. Eng. 2003	ASC	T	FT	18	7	7		H	H	M
16. Koziel, Jacek	Ph.D. Civil Eng. 1998	ASC	T	FT		11	8		M	M	L
17. Mickelson, Steven	Ph.D. AgE 1991	P	T	FT	1	30	30	EIT	M	H	L
18. Misra, Manjit	Ph.D. AgE 1978	P	T	FT		12	33		H	H	H
19. Raman, D. Raj	Ph.D. ABE 1994	P	T	FT	6	19	6	PE (TN)	M	M	L
20. Rosentrater, Kurt	Ph.D. AgE 2001	AST	TT	FT	14	3	2		H	H	H

21. Schwab, Charles	Ph.D. AgE 1989	P	T	FT		19	22		H	H	M
22. Shahan, James	M.S. AgE 1985	I	NTT	FT	1	29	32	PE (IA), Autodesk, AutoCAD	M	H	H
23. Snell, Lloyd	M.S. AgE 2008	I	NTT	FT	34	4	4	FE	L	L	H
24. Soupir, Michelle	Ph.D. BSE 2008	AST	TT	FT	1	4	4	EIT	M	H	M
25. Steward, Brian	Ph.D. AgE 1999	P	T	FT	5	15	13	PE (IA)	H	H	M
26. Tang, Lie	Ph.D. AgE 2002	ASC	T	FT	2	10	8		M	H	M
27. Tim, U. Sunday	Ph.D. Civ. Env. Eng. 1987	ASC	T	FT		22	22		M	M	L
28. Xin, Hongwei	Ph.D. Engr. 1989	P	T	FT			19		H	H	H
29. Yu, Chenxu	Ph.D. BSE 2003	AST	TT	FT	2	5	5		M	M	L

Instructions: Complete table for each member of the faculty in the program. Add additional rows or use additional sheets if necessary. Updated information is to be provided at the time of the visit.

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other
2. Code: T = Tenured TT = Tenure Track NTT = Non Tenure Track
3. Code: FT = Full-time PT = Part-time Appointment at the institution.
4. The level of activity (high, medium or low) should reflect an average over the year prior to the visit plus the two previous years. Note – we have considered applied, industrially supported research to be another form of industrial contact, and rated faculty accordingly.

B. Faculty Workload

Table 6-2 shows the Faculty Workload Summary for the A E program. Typical expectations are for faculty to teach 18 semester hours annually per FTE, so that a 50% teaching appointment is targeted to teach three three-credit classes per year. However, the department leadership appreciates that variations in course type (lecture vs. lab intensive), course enrollment (one small section vs. multiple large ones) experience with course (new prep vs. multiple offerings), stage of career, and graduate teaching assistant support mean that the credit hour per FTE value must have significant flexibility to be equitable.

Table 6-2. Faculty Workload Summary
Agricultural Engineering

Faculty Member (name)	PT or FT[1]	Classes Taught (Course No./Credit Hrs.) Term and Year[2]	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Bern, Carl	PT	A E 363 3 cr. F11 A E/BSE 469/569 3 cr. S12	30	10	10	60
Birrell, Stuart	FT	A E 342 3 cr. S12 A E 340 3 cr. F11	50	40	10	50
Brumm, Thomas	FT	A E/BSE 325 3 cr. F11	10	5	85	10
Darr, Matthew	FT	A E 410/510 3 cr. S12	30	65	5	30
Freeman, Steven	FT	non A E/BSE only	25	5	70	2[6]
Glanville, Thomas	PT	non A E/BSE only	0	30	35	2
Grewell, David	FT	non A E/BSE only	45	45	10	2
Hanna, H. Mark	FT	No teaching appt.	0	25	75	2
Harmon, Jay	FT	A E 415 2 cr. F11 A E 416 2 cr. F11	25	15	60	25
Helmers, Matthew	FT	No teaching appt.	0	45	55	2
Hoff, Steven	FT	A E 472/572 3 cr. S12 A E/BSE 216 3 cr. F11 A E/BSE 218 3 cr. S12 A E 404/504 3 cr. F11	60	30	10	60
Hurburgh, Charles	FT	No teaching appt.	0	60	40	2
Kaleita, Amy	FT	A E 436/536 2 cr. S12 A E 431/531 3 cr. F11 A E/BSE 110 1 cr. S12 ENGR 101 1 cr. F11 ENGR 160 1.5 cr. F11	50	40	10	60

Kanwar, Ramesh	PT	Post-chair leave	5	15	13	2
Keren, Nir	FT	Non A E/BSE only	40	50	10	2
Koziel, Jacek	FT	A E 524 1 cr. S12 ENGR 160 3 cr. S12	35	55	10	35
Mickelson, Steven	FT	A E 201 1 cr. F11	20	20	60	40
Misra, Manjit	FT	No teaching appt.	0	0	100	0
Raman, D. Raj	FT	BSE 480 3 cr. F11 ENGR 160 1.5 cr. F11	45	45	10	55
Rosentrater, Kurt	FT	BSE 380 3 cr. S12	45	45	10	45
Schwab, Charles	FT	Non A E/BSE only	25	25	50	2
Shahan, James	FT	A E 271 1 cr. S12 A E 272 1 cr. S12 A E/BSE 170 3 cr. F11 A E 271 1 cr. F11 A E 272 1 cr. F11	90	0	10	90
Snell, Lloyd	FT	Non A E/BSE only	80	0	20	2
Soupir, Michelle	FT	A E 436/536 1 cr. S12 A E 537 3 cr. F11	25	65	10	25
Steward, Brian	FT	A E 388 1.5 cr. F11 A E 413 3 cr. F11	55	35	10	55
Tang, Lie	FT	A E/BSE 316 3 cr. F11 A E 363 1 cr. F11	40	50	10	40
Tim, U. Sunday	FT	A E/BSE 170 3 cr. F11 A E 408/508 3 cr. F11	40	50	10	40
Xin, Hongwei	FT	No teaching appt.	0	40	60	2
Yu, Chenxu	FT	A E/BSE 451 3 cr. F11 A E 551 3 cr. F11	50	40	10	50

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution
2. For the academic year for which the self-study is being prepared. **Graduate only courses not listed here**
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."
5. Out of the total time employed at the institution.
6. We consider 2% the incidental effort by faculty who teach primarily technology courses, many of which have some number of engineering program students enrolled each semester. We also know that extension faculty end up advising student teams (sometimes as formal mentors of design teams), and thus assign them 2% here also.

C. Faculty Size

On a simple headcount basis – which is the basis used by most peer engineering departments – our undergraduate student-to-faculty-ratio is roughly 550 students / 23 faculty with some teaching appointment = 24:1.

Attempting to compute student-to-faculty-ratios on a programmatic basis is difficult due to issues of overlap and effort apportionment across the four degree programs offered by our department – for example, a faculty member might teach a course with 60 – 80% technology students, 15% A E students, and the remainder in BSE, and these numbers change semester to semester. This same faculty member may have raised $200k for improvements to a lab that is used 30% – 10% – 60% by A E, BSE, and technology students respectively, may serve on the engineering, but not the technology program, curriculum committee, and may mentor two capstone groups in the technology program. We have yet to find a reliable method to delineate these multiple efforts without an onerous reporting system. As a first approximation, and recognizing the uncertainty in the resulting numerical values, we can make a rough computation by summing the fractional efforts in the rightmost column of Table 6-2, which suggests we have 7.86 teaching FTE devoted to our engineering degree programs. Since most departments do not distinguish teaching and research when computing these ratios, we assume an average 50/50 split and compute 15.7 as an equivalent headcount for our engineering degree programs. These two programs (A E and BSE) together enroll approximately 250 students, meaning we achieve a 16:1 student-to-faculty ratio in our engineering programs. These numbers suggest we are in a reasonably low range of student-to-faculty, and student comments about the hands-on, student-centered nature of the department suggest the experiences we provide students are in keeping with low student-to-faculty ratios. The placement of our students in national competitions, their strong FE performance, and their high demand by industry, suggest that our faculty is keeping up with the needs of the students in the A E program. A challenge area is senior design, where each team needs a strong and involved mentor to be successful, and where a single faculty member has been covering the two-semester design sequence for several years. We are moving lecturer resources to this faculty member to assist in the fall of 2012.

The popularity of the A E program over the past six years, along with the addition of the new BSE degree program and the growth in the undergrad technology programs has helped the department hold onto faculty slots as retirements have occurred. The loss of key teaching faculty members to internal activities (e.g., Mickelson to Chair, Brumm to COE leadership) has been partially offset by salary savings that have been used to fund lecturer positions.

We currently have two faculty positions open, and hope to have these filled by summer 2013. One of these positions will focus in Manufacturing Technology and Engineering (to serve the burgeoning Industrial Technology program), the other in Biomass Production Management. This latter position will have an extension/research focus, but is expected to also have a partial teaching appointment doing the critical A E/BSE 469/569 grain quality and handling course. This position will also relieve some of our high-demand teaching faculty from extension work they are currently doing to fill a gap, and will help the engineering degree programs indirectly.

Student advising has become the purview of our professional advising staff, and faculty members now serve primarily in a professional mentoring role. These roles are particularly strong between students who work in faculty labs, or on design projects mentored by faculty members, or who are in clubs advised by our faculty members.

ABE faculty members are leaders on campus, playing key roles in multiple high-impact research, teaching, and extension efforts (e.g., CenUSA USDA AFRI CAP Center, Egg Industry Center, Midwest Plan Service, NSF Engineering Research Center for Biorenewable Chemicals), and in faculty governance roles. ABE faculty members pursue multiple avenues of professional development (see Appendix B for details). ABE faculty members also interact regularly with employers, through the interactions with our External Advisory Council, through their presence at multiple career fairs each year, and through their research programs, many of which are funded by companies that employ our graduates.

D. Professional Development

Faculty members engage in professional development through attendance at professional meetings focusing on scientific, engineering, and educational principles, organized by professional societies (e.g., ASABE, ASEE) and governmental organizations (e.g., NSF Engineering Education Awardees Conference). An examination of the abbreviated lists provided in Appendix B shows the diversity of activities pursued.

E. Authority and Responsibility of Faculty

The ABE ECC chair and vice-chair have primary responsibility for the ABET report and for running and documenting meetings of the ABE ECC. They work with the ABE ECC to guide, refine, and implement the processes for the evaluation, assessment, and continuing improvement of the program, including its program educational objectives and student outcomes. The ABE ECC chair also has primary responsibility for overseeing the course catalogs, and for signing on student substitution forms, and is assisted in these tasks by the two professional academic advisors and is advised by the entire ABE ECC. All substantive curricular decisions including those related to course substitutions are the jurisdiction of the faculty membership of the ABE ECC as a whole, not of the ABE ECC chair, nor of the departmental Chair, nor of the Associate Chair for Teaching. In cases where the ABE ECC considers substantive changes to any specific course, the course instructor is included in the discussion (if they are not members of the ABE ECC to begin with).

The ABE ECC is assisted in its continuous improvement process efforts by The Associate Dean for Education in the College of Engineering, who provides leadership and guidance on issues of common concern. The Associate Dean oversees the Basic Program, the Classification Office and provides funds for faculty improvement, training, and innovation in this area (e.g., travel funds to assessment conferences, the recent Dean's Education Initiative, etc.).

Engineering Career Services (ECS) provides a number of assessment services to the program.

- It implements the assessment process for students in engineering experiential education settings using OPAL™ - Online Performance and Learning (described in

Criteria 4 – Continuous Improvement). On an annual basis, ECS provides programs with data of supervisor and student self-evaluation of 15 workplace competencies.

- It implements OPAL™ for student self-assessment in classes.
- It implements OPAL™ for graduate self-assessment.
- It conducts graduate surveys for the programs and summarizes the responses.
- It provides placement data to the programs each semester.

The College of Engineering ABET Committee serves as a forum for programs to share and seek information about their continuous improvement processes. Each degree program within the College has a representative on the committee which meets monthly throughout the academic year. Additionally, the Committee analyzes, summarizes, and distributes to programs the results of the Fundamentals of Engineering Examinations.

In 2011, the A E program wrote a draft self-study, along with each of the other COE programs. The COE hired a consultant with significant ABET experience who reviewed the self-studies of all programs, providing both written responses and two hours of face-to-face contact with each program reviewing their document and continuous improvement processes.

CRITERION 7: FACILITIES

A. Offices, Classrooms, and Laboratories

1. The program currently has access to office space in four buildings, Davidson Hall, Industrial Education II (IED-II), National Swine Research Information Center (NSRIC), and Food Science and Human Nutrition (FSHN). The first two in this list – Davidson Hall and IED-II, are exclusively ABE, while the latter two are only partially ABE: NSRIC third floor is all ABE, and additional offices and labs are on the basement and ground floor of that building, while ABE faculty members occupy a small wing of the FSHN building. The Chair is housed in Davidson Hall, along with 17 faculty members and all central staff (e.g., Departmental Head Program Assistant, Systems Support Specialist). The Associate Chairs for teaching and for research are housed in NSRIC, which was their location prior to their installment as Associate Chairs. Also in NSRIC are four (soon to be five) more faculty members, and multiple programmatically-oriented staff members (e.g., Water Quality Lab Program Assistant, Program Assistant for multiple internship programs overseen by Associate Chair for teaching). The IED-II building houses five faculty members, all three professional academic advisors, and several other program staff members, while FSHN is home to two faculty members and their programmatic support staff. All faculty members are currently in single occupant offices, as are virtually all staff. Faculty and staff offices typically have desktop PCs and/or laptop systems with docks and with high-speed internet access. Most faculty offices are suitable for meetings with small groups of 2 – 3 students, and all faculty offices are situated close to conference rooms that can be used for meetings with larger groups of students.

2. Classrooms and associated equipment that is typically available where the program courses are taught.

Room	Area (ft^2)	Seating	Typical A E undergraduate classes taught	Comment
110 Davidson	760	36	216, 415, 416	Renovated ‘12
115 Davidson	755	40	363, 342, 413	Renovated ‘06
119 Davidson	270	5	415, 416 Teaming Room	Renovated ‘12
124C Davidson	585	32	340, 406X, 431, 472, 480	Renovated ‘03
143 Davidson	861	18	110, 363, 469	Updated ‘05
101 I Ed II	1,236	80	201, 203, 301, 401	University Classroom
201 I Ed II	1,867	40	110, Engr 170 (AE LC Section), 201, 271, 272, 301, 401, 404	Renovated ‘05
209 & 219 IED II	150	5	415, 416 Teaming Room	Renovated ‘12

3. Lab facilities for ABE students are shown in the table below. Addition details on computing infrastructure are in the next section (B), and a listing of major equipment used by the program in support of instruction is provided in Appendix C.

Room	Area (ft^2)	Seating	AE undergraduate classes taught	Comment
125D Davidson	707	Computer Lab	203, 406X; open lab for all AE courses	3 yr hardware cycle
125E Davidson	608	Open Computer Lab	Open lab for all AE courses	3 yr hardware cycle
132 Davidson	1783	Fabrication Lab	110, 415, 416	
142 Davidson	1716	Biomaterials Lab	110, 216, 415, 416, 465, 469, 490	Renovated 1997
143 Davidson	861	Electric Power Electronics	110, 363	Renovated 2005
147 Davidson	1260	Deere Engines Lab	110, 342	Renovated 1997
150 Davidson	1013	Fluid Power Laboratory	110, 340, 413, 415, 416	Renovated 2004
170 AE Machine Shed	2251	Power and Machinery Laboratory	110, 340, 413, 415, 416, 437	Renovated 1999
10 I Ed II	1548	Electronic Sensor/ Controls Laboratory	363, 404	Renovated 2005
10A I Ed II	751	Computer Laboratory	Open computer lab when courses are not in session.	
117 I Ed II	265	Study Room	Engr 101, 110, 201, 203, 216, 301, 363, 401; open lab	Renovated 2005

B. Computing Resources

There are numerous computer labs on campus, including both public labs and college and department labs. Public labs are accessible to everyone at the university, funded by the student computer fee paid by all students, and managed by the Computation Advisory Committee (CAC). College and department labs may be exclusively for members of a specific college or department. There are computer labs available in over 38 buildings on campus, including academic and residence buildings. Every College of Engineering building has multiple computer labs available for its students. Hours of availability vary by laboratory and building, but are typically from 6:00 a.m. until 11:00 p.m. A complete listing of computer facilities and resources available to students can be found at http://www.it.iastate.edu/services/labs.

Labs are available with Windows, Macintosh and Linux operating systems. All university laboratories have Microsoft Office. Engineering students have access to these programs: Ansys, Arena, Autodesk AutoCAD, Autodesk Inventor, Autodesk Mechanical Desktop, DVT Framework, JMP, Lingo, Maple, Mathcad, MathType, Matlab, Mathematica, Microsoft Project, Microsoft Publisher, Microsoft Visio, Pro/Engineer, Pro/Mechanica, RFlow, Roxio CD Creator, Solid Edge, SolidWorks, Techplot, Visual Studio .NET.

Exit interviews of A E program graduates regularly show that computing support is excellent. Recent comments during exit interviews suggested computer space for team design work was limited, and led us to fund a just-completed upgrade of three rooms as dedicated capstone team meeting rooms. These rooms have high-performance PCs with dual monitors, webcams, and a large-screen wall-mounted display for video-conferencing with clients. These rooms will be available for students in fall 2012.

C. Guidance

All A E students take a general safety training module in the freshmen course A E 101. Additional safety training appropriate to specific equipment in each course is provided by instructors prior to lab work.

D. Maintenance and Upgrading of Facilities

Maintenance and upgrading are done primarily on an as-needed basis, using departmental funds which have increased in recent years due to the COE leadership passing differential tuition funds directly to departments. In addition to base funding from differential tuition, the COE has provided competitive funds for major equipment renovations, and these funds have been amended by significant funds from industrial supporters of the department. Students also pay a significant computer fee, a large part of which is returned to the department where it is used for replacement of computers in labs on a regular (3 yr) rotation.

A major concern for the program department has been its buildings. While the department has done extensive remodeling of Davidson Hall and of Industrial Education II over the past decade and a half to update rooms constructed in the 1940's into more modern space with adequate lighting, ventilation, and fire safety features that serve basic needs, they have not provided the quantity or quality of space expected of a modern high-technology curriculum. Additionally, having our teaching laboratories spread across campus in three different buildings is very inefficient, allowing little sharing of equipment and tools between courses. In 2011, arguably after a 40-year delay, the state approved the construction of the two-part new building for ABE. At the time of this writing, construction is well under way and expectations are that the department will be occupying the new building by fall term 2014.

E. Library Services

As a research-intensive institution, the library facilities at Iowa State University are more than adequate for the program. Specifically, the University Library provides a wide array of print, non-print, and electronic information resources, which are housed in the main Parks Library, the e-Library, and three branch libraries (Design, Mathematics, and Veterinary Medicine). The library's extensive collections support research and study for all ISU

programs, with the strongest support at the Ph.D. level. These collections are nationally recognized for their strengths in basic and applied fields of biological and physical sciences. Library holdings include more than 2.4 million volumes and over twenty-nine thousand serial subscriptions.

The library encourages use of its collections and many services, and assistance is provided at seven public service desks. These desks include the Reference Desk, the Reserve and Media Services, Interlibrary Loan/Document Delivery, the Circulation Desk, the Microforms Center, Special Collections, and the Map Room. In addition, instruction in the use of library resources is offered to graduate and undergraduate students.

The library's e-Library, accessed through the Internet, provides access to the local online catalog; indexing and abstracting databases; electronic journals and books; and selected Internet sites. The capabilities of the ISI Web of Knowledge are particularly useful to students seeking to understand the literature relevant to specific engineered systems. Assistance in using this vast body of electronic resources is available at the Reference Desk and through individually arranged appointments with reference librarians.

Each academic area in the College of Engineering has a subject librarian responsible for library collections and access that works with the departmental faculty liaison. The subject librarian is the primary contact for department/program faculty for questions and information regarding library collections, instructional support, and reference services.

The library's technical collection and access to additional resources is adequate to meet the needs of the program and the faculty. The process by which faculty may request books or subscriptions is transparent, accessible and adequate. The system for locating and obtaining electronic information is adequate and supported by library professionals.

F. Overall Comments on Facilities

All teaching facilities staffed with responsible authorities while class is in session. Every teaching building used by the program has a building manager who, along with the departmental Facilities and Safety Committee, periodically visits labs/shops to check for potential safety issues. Regular visits by the Fire Marshall also occur, helping to ensure that buildings are meeting fire codes. Recently, the safety process has come under scrutiny due to tragic accidents at several prestigious US institutions. Since January 2012, we have stressed that it is departmental policy that no student work in a laboratory without proper safety training and equipment, and that primary responsibility for this lies with the faculty member in charge of a particular course or research lab space. Leadership of the ABE Facilities and Safety Committee has received a $241k grant from the COE to improve lab safety across the COE within a project entitled the Shop Safety Enhancement Learning and Training (SSELT) Infrastructure Project. The SSELT will establish a system that includes rigorous shop safety training modules and the supporting infrastructure enabling the functions listed below:

- Document management & handling system
- Training renewal alert system (providing instructors and academic administrative units alerts when required retraining has not been completed)
- The system will interface with:

- Access control management system(s) (available for controlled access systems once installed)
- Tool secure lock-out functions
- Tool specific training modules
- Learning systems (e.g., EH&S WebLearner and Blackboard Learn)
- Registrar's databases to facilitate authoritative functions.

CRITERION 8: INSTITUTIONAL SUPPORT

1. Leadership

All substantive curricular decisions including those related to course substitutions are the jurisdiction of the faculty membership of the ABE ECC as a whole. To ensure the quality of the program, membership on the ABE ECC is dominated by faculty members who have been recognized at multiple levels (departmental, college, university, and nationally) for their teaching abilities, and who are committed to a vision of the department's engineering programs being world-class, through a commitment to hands-on, career-relevant instruction that prioritizes an understanding of how scientific principles and mathematics can be leveraged to meet critical human needs through the practice of engineering.

As explained elsewhere in this document, the ABE ECC chair and vice-chair have primary responsibility for program leadership. This includes overseeing the continuous improvement process, authoring the ABET report, and running and documenting meetings of the ABE ECC. In addition, the ABE ECC chair also has primary responsibility for overseeing the course catalogs – which are the "contract" with our students, and for signing on student substitution forms. Able assistance in execution of these last two tasks is provided by the two professional academic advisors, who are both non-voting members of the ABE ECC, while decisions on substitutions and curricula are made by vote of the ABE ECC.

2. Program Budget and Financial Support

1. Iowa State University's approach to the management of financial resources involves both local and central decision-making to meet present needs and obligations as well as to make progress on strategic planning goals. Vice presidents, deans, directors, and department chairs have the authority to plan the budget(s) of the unit(s) under their administration, and the responsibility to see that resources are used wisely and in a manner consistent with University and board policies. Each administrator is given the flexibility to respond to emerging needs or long-range goals by shifting and realigning resources within the total block of funds assigned to their particular unit, e.g., shifting resources between equipment and supplies accounts and those used for salaries.

   The Resource Management Model (RMM) was implemented in July 2008. This budget model forms the core of a larger set of processes and policies that inform and shape the university's annual operating budget, referred to as the general fund. This fund's revenue sources include tuition revenues, state appropriations, and indirect cost recovery. Student fees, sponsored funding, private fundraising cash receipts, and pooled investment earnings are also pieces of the college's comprehensive budget that leverage the general fund, supporting the goals of the college.

   Due to the dynamic fiscal environment in higher public education, this budget model links responsibilities with resource decisions and provides a more effective way to accomplish the goals of the university's strategic plan. The model has undergone a university-wide review. The formulaic component of the RMM will be modified in some ways, beginning July 2013.

The College of Engineering Dean determines the Engineering budget within the context of the university and makes plans for its educational, research, and extension programs. The highest priority is the quality of the student learning experiences. The College is well positioned to respond to the resource fluctuations and customer needs for this year and beyond by having taken steps to implement a leaner, more efficient, and more collaborative administrative structure and business model.

The intention and philosophy of the college is to improve the ability of academic departments to allocate resources under local control for the benefit of student learning. The Dean determines the number of new positions that will be filled, allocating salary and benefits to academic departments for hiring tenure-eligible and tenured faculty into their programs. These allocations are based on the proposed alignment with the college's strategic and operational plans. Additionally, departmental administrators' operating budgets are adjusted according to long and short-term incentives based on their student enrollment and teaching efforts. For example, the college allocates flexible technology fees, summer teaching, and tuition revenues proportionally to the academic departments based on the enrollment of the students and the student credit hours of instruction.

The student computer/technology fees collected by the University are distributed to the colleges based on the number of majors and the number of student credit hours (SCHs) taught. The college's Engineering Fee Task Force then, after paying first for college-wide computer needs, distributes the remaining funds to the departments based on the same two factors.

Upper level (60+ credits) undergraduate and graduate engineering students are assessed a tuition rate (a.k.a., differential tuition) that is higher than most other majors at Iowa State University. This money, in addition to state appropriations and indirect cost recovery, funds the college of engineering's programs such as faculty salaries, office supplies, and utilities. The College budget model has financially incentivized student recruitment and retention by proportionally allocating $1.8M of the flexible differential tuition pool based on the enrollments of students who pay it.

Full time resident undergraduate engineering juniors and seniors paid an additional $1,043 for the fall 2011 semester. Engineering students entering the university directly from high school receive a four-semester exemption from differential tuition; the exemption for transfer students is two semesters.

2. Departmental funding for graders, written policies requiring all graduate students to provide at least one semester of teaching support, differential tuition flows to provide stable graduate teaching assistants to high-lab instructors, and a strong university level Center for Excellence in Learning and Teaching (CELT) all contribute to the program having an extremely supportive environment for teaching quality. The ABE Chair's prior experience as the CELT Director informs the Chair's commitment to teaching in the A E program.

3. The program has adequate budgetary resources to attain student outcomes. The decision of the outgoing dean to make major cuts to central COE administration and to pass the savings on to departments was extremely helpful in this regard.

3. Staffing

In general, the department has strong staffing to deliver the program. As student numbers grow, one challenge will be the maintenance of high-quality lab experiences without overburdening faculty. To this end, the ABE leadership team has prioritized providing 2-year blocks of differential-tuition-generated funds to high-lab-teaching faculty to hire graduate teaching assistants who will focus on supporting their labs. Furthermore, the department has a policy requiring all graduate students to provide some level of teaching support during one semester of their programs (the level varies by degree program), thereby leveraging the high number of research associates (>50) to assist with teaching. High quality staff members may be retained through salary adjustments. Staff members are encouraged to participate in professional development, and departmental funds are provided for these activities.

4. Faculty Hiring and Retention

Regardless of the reason, when a tenure-track or tenured faculty member leaves a department, the salary and benefits return to the COE and are then pooled for all such positions across the college. The originating department retains $25k of salary savings for one year to support temporary lecturers or teaching assistants during the transition. The college determines the number of new positions that will be filled, after taking into account such factors as the budget climate, contingency for target-of-opportunity hires, and department chair searches.

Department chairs submit proposals to hire tenure-track or tenured faculty in their departments, for the current year and within the context of a broader multi-year plan. Those proposals estimate the rank of the hire, salary and benefits, start-up costs, and the department's commitment towards the start-up costs. The proposals are shared among the department chairs, the dean, the associate and assistant deans, and senior staff, to explore multiple perspectives and the potential for shared positions. Ultimately, the Dean allocates salary and benefits for hiring tenure-track or tenured faculty. Once a hiring proposal is approved, the department may search for one year to fill the position. Thereafter, the department may request an extension.

Core values informing faculty positions decisions include: strategic research fit in energy systems, biosciences and engineering, information and decision sciences, sustainability, and critical infrastructure; lowering the student-faculty ratio and promoting teaching excellence; enhancing faculty diversity; supporting research centers and institutes; keeping strong programs strong; advancing interdisciplinary teaching and research; and establishing natural and meaningful collaboration between engineering departments, and with other colleges.

Retention of qualified faculty members is done on a case-by-case basis, but typically involves salary increases and provision of additional resources. Named professorships and associated prestige and funding are also used to retain highly qualified faculty members.

5. Support of Faculty Professional Development

The ABE leadership team recognizes that faculty professional development is a crucial part of maintaining a strong program and professional development activities and plans are discussed during each faculty member's annual review. The department encourages faculty members to support such activities using their grant-derived funds, incentive funds, or university-wide funds, but will provide funding in extenuating circumstances.

The University similarly recognizes the importance of professional growth and development and believes that the Faculty Professional Development Assignment (FPDA) Program (a.k.a. sabbaticals) is one of the best modes in which to achieve such growth and development. The University strives to promote an environment in which the faculty will be motivated to participate enthusiastically in the Faculty Professional Development Assignment Program. This environment permits both the faculty and administration to plan so as to obtain the desired results from the program. FPDA may be used to a number of purposes. Examples include: to conduct research or scholarship, to obtain new or specialized training; and to participate in an international program such as the Fulbright program.

PROGRAM CRITERIA

Please refer to Criterion 5 section 5 (pg. 47) for a description of how the program satisfies the A E program criteria.

APPENDIX A: Course Syllabi

Course Number and Name	AE 110 Experiencing Agricultural and Biosystems Engineering
Credits and Contact Hours	(0-2) Cr. 1. S.
Instructor/Course Coordinator	Amy Kaleita-Forbes Susan K. Ziegenbusch Chris Hoffman (Peer Mentor Coordinator) Dustin Schau (Peer Mentor Coordinator)
Textbook and supplemental materials	No textbook is required for this course. Individual laboratory instructors will provide the necessary handouts and materials.
Catalog Description	Laboratory-based, team-oriented experiences in a spectrum of topics common to the practice of agricultural and biosystems engineering. Report writing, co-ops, internships, careers, registration planning.
Pre-requisites	None
Required/Elective/Selected	Required
Specific Outcomes	Course Purpose • This course gives you the opportunity to experience in a "hands-on" way a number of different areas covered by the agricultural engineering discipline and curriculum options. • This course introduces you to the concepts of workplace competencies. • This course helps you to start sharpening some important competencies: analysis and judgment, engineering knowledge, and teamwork. Departmental Objective • Build community for freshman within Agricultural Engineering • Increase student involvement within the Department of ABE • Increase involvement in professional society and student branch • Increase student interaction with upperclassmen • Increase student retention in the AE program Course Objectives • Develop team skills • Introduce students to various agricultural engineering experiences • Learn of the various options within agricultural engineering • Experience hands-on laboratories related to the AE options • Build excitement for engineering • Career development/job preparation • Faculty mentoring in helping make option decisions • Develop report writing skills • Receive academic guidance on registering for classes
Topics	See following course outline

Week	Dates	Topics	Reading	Homework
1	1/10, 1/12	Introduction/Teamwork Development		View EHS Fire Safety video/ABE safety video
2	1/17 1/19	Making Biodiesel (BRL, meet in the lobby) – Dr. Brumm		Assignment: Complete team lab report
3	1/24, 1/26	Presentation by ECS personnel Resume Modification, Career Fair tips, Preparation Discussion at OOCM		
4	1/31, 2/2	Electric Motor Testing (143 Davidson)– Dr. Bern		Complete team lab report
5	2/7, 2/9	Biosystems Lab (3242 NSRIC)– Dr. Kim/Raman		Complete team lab report
6	2/14, 2/16	Registration Planning (124 I Ed II) - Learning Community pre-registration		Complete revisions of academic course plan and submit
7	2/21, 2/23	Fan/Grain Systems (142 Davidson) – Dr. Brumm		Complete team lab report
8	2/28, 3/1	Industry Visit: ALMACO Tour (Nevada) – Nick Merfeld. Leave from I Ed II parking lot promptly at class start time		Customer Focus STAR http://www.almaco.com/
9	3/7, 3/9	Tractor Engine Laboratory (147 Davidson) – Dr. Birrell		Complete team lab report
	3/12 – 3/16	SPRING BREAK		
10	3/20, 3/22	Dean of Students Presentation (124 I Ed II)		
11	3/27, 3/29	Lincolnway Energy (Nevada). Leave from I Ed II parking lot promptly at class start time		Continuous Learning STAR
12	4/3, 4/5	Soil and Water Conservation Engineering (Location TBD) - Dr. Soupir		Complete team lab report
13	4/10, 4/12	Vegetated Treatment Area (Nevada) Leave from I Ed II parking lot promptly at class start time		Engineering Knowledge STAR
14	4/17, 4/19	BioCentury Research Farm – Andy Suby. Leave from I Ed II parking lot promptly at class start time		Complete team lab report
15	4/24, 4/26	Lab: Agricultural Power and Machinery Laboratory: Fluid Power (150 Davidson)– Dr. Steward		Complete team lab report
16	Finals Week			

Course Number and Name	AE 170. Engineering Graphics and Introductory Design
Credits and Contact Hours	(2-2) Cr. 3. F.S.SS
Instructor/Course Coordinator	James Shahan
Textbook and supplemental materials	Fundamentals of Graphics Communication, 6th Edition, Gary R. Bertoline, Et. Al. McGraw-Hill Higher Education, New York, NY. Parametric Modeling with Autodesk Inventor 2012, Randy H. Shih, Schroff Development Corporation, Mission KS
Catalog Description	Solving engineering problems and presenting solutions through technical reports. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to mechanics, statistics and engineering economics. Use of spreadsheet programs to solve and present engineering problems. Solution of engineering problems using computer programming languages. (The honors section includes application of programming to mobile robotics).
Pre-requisites	MATH 142 or satisfactory scores on mathematics placement examinations; credit or enrollment in MATH 142
Required/Elective/Selected	Required
Specific Outcomes	Expected Student Learning Outcomes Ability to graphically represent technical designs using accepted standard practices - ABET Criteria 2000 (k) Ability to create and communicate design solutions - ABET Criteria 2000 (g) Solved technical design problems, using sketches and computer-aided-design - ABET Criteria 2000 (k) Applied technical graphics principles to many engineering disciplines Ability to apply the design process to an open-ended design problem - ABET Criteria 2000 (c)
Class Procedures	Assignments are due at the beginning of the next period, in a format specified by your instructor. Do not share computer files (files are checked). No late homework will be accepted unless prior permission has been granted. Grades on the design projects will be determined from written reports, oral presentations, individual assignments specified by the instructor, and peer evaluations. Your attendance is expected for the duration of every class period. Consideration for making up missed work, including scheduled exams, will be based on your attendance and previously submitted assignments.
Topics	See below

Week	Dates	Topics	Reading	Homework
1	8/22 8/24	Introduction /Lettering/ Sketching (Adjuster) Parametric Modeling - Printing (Locator)	GB 1-4 RS	Ex 2.21 Ex 2.4 or 3.2
2	8/29 8/31	Multi-views / Pictorial Drawings (Saddle Bracket) Parametric Constraints Fundamentals (Plates)	GB 5,7 GB	Ex 5.5 Fig 5.137 or 5.144
3	9/5 9/7	University Holiday Auxiliary Views / Section Views (Gasket)	 GB 6,8	 Ex 8.5
4	9/12 9/14	Dimensioning I: Size / Location (U-bracket) CAD – Views / Dimensioning (WWW / U-bracket)	GB 9.1-9.4 GB	Ex 9.2 Fig 6.25 or 8.66
5	9/19 9/21	Limit Dimensions: Basic / Standard (Rod Guide) Symmetrical Features (Pulley)	GB 9.4-9.9 RS 9,10	9.3 Ex 9.2 or 10.3
6	9/26 9/28	Support Assembly I- Part Model and Drawings Exam I	RS 13	
Scan / Analyze / Prototype				
7	10/3 10/5	Project Introduction / Research / Advanced Part Modeling Part I: Scan and Convert		
8	10/10 10/12	Part II: Part Design and Drawing Part III: Assembly Model and Drawing		
9	10/17 10/19	Part IV: Prototype / Report Part V: Finish		
Conceptual Design				
10	10/24 10/26	The Engineering Design Process Design:		
11	10/31 11/2	Design: Design:		
12	11/7 11/9	Design: Design: Presentation		
CAD II – Assembly Modeling (In-class)				
13	11/14 11/16	Introduction to Stress Analysis (Tutorial) Assemblies/Working Drawings (Support Assembly II)	RS 16 GB 13	Ex 1 or 2 Crank Slider I
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14	11/28 11/30	Standard Parts (Crank Slider II) Assembly Model (Geneva Cam II)	RS 14 RS 15	Geneva Cam I Practice – Parts
15	12/5 12/7	Sheet Metal Designs Practice - Mechanisms	RS 12	Practice – Parts Practice - Assy
16	Finals Week	Exam II		

Course Number and Name	AE 201. Entrepreneurship and Internship Seminar
Credits and Contact Hours	(1-0) Cr. 1. F.S.
Instructor/Course Coordinator	Steven Mickelson
Textbook and supplemental materials	None
Catalog Description	Eight week course. Professionalism in the context of the engineering/technical workplace. Development and demonstration of key workplace competencies: teamwork, initiative, communication, innovation, and customer focus. Resumes; Professional portfolios; Preparation for internship experiences.
Pre-requisites	Sophomore classification in A E, AST, BSE or ITec
Required/Elective/Selected	Required
Specific Outcomes	ABE Key Assignments: resumes, cover letters, STARs, competency executive summaries for the portfolio Key Competencies Addressed in the Course: Communication, Initiative, Communication, Engineering/Technical Knowledge Student Learning Objectives: Integration and development of human capital factors leading to success in professional internships and careers Ability to reflect on meaningful experience that have led to competency development Ability to communicate effectively through the development of student electronic portfolios for the demonstration of workplace competencies. Ability to manage your careers Understanding of entrepreneurship Understanding of financial planning Ability to identify and pursue opportunities that produce value An ability to communicate effectively The broad education necessary to understand the impact of engineering solutions in a global, economic, environ-mental, and societal context. A recognition of the need for, and the ability to engage in, life-long learning A knowledge of contemporary issues
Topics	See below

Week	Dates	Topics	Reading	Homework
1	Aug. 22 Aug. 24	Course Overview, Developing a Successful Resume Engineering Career Services – Mike Gaul		Resume
2	Aug. 29 Aug. 31	Developing a Cover Letter Agriculture Career Services – Roger Bentley; International Programs/Study Abroad opportunities		Cover Letter
3	Sept. 5 Sept. 7	NO CLASS University Holiday Behavioral Based Interviewing, Workplace Competency Demonstration: Adam Sporrer (Almaco)		 STAR
4	Sept. 12 Sept. 14	Development of a Professional Portfolio (Resume, STARS, Key Artifacts) Industry Speakers: Keith Heiar (CAT), Jeff Fleenor (Fleenor Mfg)		Executive Summary
5	Sept. 19 Sept. 21	Innovation/Entrepreneurship – Kevin Kimle (ISU Economics) Sam Hurst (Kreg Tools), Joe Payton (Pella Windows)		Initiative Competency
6	Sept. 26 Sept. 28	Professional Impact, References, Letters of Recommendation Industry Speakers – Justin McGill		Teamwork Competency
7	Oct. 3 Oct. 5	Developing as a Leader International Programs in ABE Industry Speakers – Josh Jacobson (Arch Wall); Adam Crutchley (Bartlett and West)		Engineering/Technology Knowledge Competency
8	Oct. 10 Oct. 12	Financial Planning – Jeanna Nation, Financial Counseling Clinic Course/Instructor Assessment		 Portfolio Due 10/14 5p

Course Number and Name	AE 216. Fundamentals of Agricultural and Biosystems Engineering
Credits and Contact Hours	(2-2) Cr. 3. F.
Instructor/Course Coordinator	Steven J. Hoff
Textbook and supplemental materials	Manual developed using department faculty. Selected chapters from: Midwest Plan Service Structures and Environment Handbook, 11th Edition (1987); Managing Grain After Harvest (C.J. Bern and C.R. Hurburgh, 1999)
Catalog Description	Application of mathematics and engineering sciences to mass and energy balances in agricultural and biological systems. Emphasis is on solving engineering problems in the areas of heat and mass transfer, air and water vapor systems; animal production systems, grain systems; food systems, hydrologic systems, and bioprocessing.
Pre-requisites	A E 110, ENGR 160, credit or enrollment in MATH 166
Required/Elective/Selected	Required
	General Course Objectives: To help students understand various systems of units and the conversion to and from each. To help students understand the concepts of potential, flow, and resistance and the similarities between analogous systems. To help students recognize and develop control volumes for conducting mass and energy balances. To help students recognize differences between conduction, convection, radiation, and evaporation heat transfer. To help students understand dry air-water vapor mixture properties and processes. To help students develop governing relations for determining both sensible and latent heat transfers. To help students apply fundamental energy and mass balance equations to animal environment, grain drying, and biological systems.
Specific Outcomes	Determine the potential forces and resistances for electrical and heat flow applications. Determine the overall thermal resistance of any structure consisting of series and parallel insulating materials. Calculate all psychrometric properties and be able to set-up and solve common moist air processes. Perform an energy and mass balance on applied problems in animal housing, grain drying, and biological systems.
Topics	See Below.

Week	Dates	Topics	Reading	Homework
1		Dimensions and units		
2		Analogous systems		
3		Developing control volumes		
4		Component mass balances		
5		Component energy balances		
6		Heat transfer		
7		Psychrometric properties		
8		Psychrometric processes		
9		Mass and energy balances applied to animal systems		
10		Mass and energy balances applied to grain drying/food processing systems		
11		Mass and energy balances applied to biological systems		

Class/Laboratory Schedule:
Class meets for two 1-hour lectures and one 2-hour laboratory per week. Laboratory sessions are handled as group-worked homework assignments with the Professor present to directly handle student questions. A few key hands-on demonstration laboratory sessions provided as needed.

Relationship to Program Objectives (Criterion 2):

This course contributes toward attainment of Program Objectives 1, 2, and 5 as follows:

1. Fundamental laws governing mass and energy transfer and balances introduced and used throughout entire semester.

2. Students work in teams during lab exercises for two design problems; one in the design of a fan system for animal housing and one in the unit operation process for corn drying

5. Selected hands-on laboratory experiences in the area of psychrometrics.

Contribution to Professional Component (Criterion 4):
Students in this course will utilize fundamental mass and energy balances to solve problems in thermal sciences. This experience, combined with selected open-ended problems, will help prepare students for their senior design experience.

Course Number and Name	AE 218. Project Management Design in Agricultural Biosystems Engineering
Credits and Contact Hours	(1-2) Cr. 2. S.
Instructor/Course Coordinator	Steven J. Hoff
Textbook and supplemental materials	Handouts given to strengthen course discussion
Catalog Description	Project management - critical path, Gantt charts, resource allocations, basic project budgeting, and project management software. Engineering design approaches. Open-ended design projects to demonstrate the preceding principles through application of technical concepts taught in prerequisite coursework.
Pre-requisites	AE 216
Required/Elective/Selected	Required
Specific Outcomes	Apply project management techniques to open-ended design projects. Apply the engineering design process, step-by-step, to any open-ended design challenge. Determine the uncertainty in a sensor measurement and determine overall process uncertainty through propagation of error. Perform an energy and mass balance on open- and closed-systems encountered in engineering.
Topics	See below

Week	Dates	Topics	Reading	Homework
1		Introduction to Course/Expectations Introduce Design Project 1/Team Assignments		
2		Martin Luther King Holiday / On-paper Design Work		
3		Engineering Design Process Project Prototype Development		
4		Project Management		
5		Project Management		
6		Uncertainty analysis / Project 1 Assessment		
7		Robotics, sensors, controls		
8		Robotics, sensors, controls		
9		Project Scheduling / On-paper Design Work		
10		Project Scheduling / On-paper Design Work		
11		Engineering ethics / Project Prototype Development		
12		Global water issues		
13		Global energy issues		
14		Project two Work		
15		Project 2 Assessment		

General Open-ended Design Projects Description *(details will be given before each design project activity)*

Project 1-AE and BSE Students, mixed in teams, randomly selected. Determine the sensible and latent heat energy input to a confined space. Develop on-paper design and concepts, devise a set-up to accomplish task, fabricate prototype, and finally demonstrate effectiveness with experimentation. Competition scoring is based on abs (percentage deviation from actual on both heat types), subtracted from 100%. Self- and peer-to-peer assessments will also be used in your overall score. An engineering notebook outlining project activities with all calculations and assumptions made must be kept and will be graded as well.

Project 2-AE Students. Develop three mechanisms that utilize three distinctly different energy sources to propel each mechanism along a prescribed path. The path of travel can be guided by rail, fixed wheel positioning, or autonomously with increasing points given, respectively. Each mechanism must follow a prescribed path and each independent energy source used for each of three distinct sections of 2-3m in length. A complete set of rules and regulations for this competition will be available. Scoring based on independence of propulsion system, time to complete task, and steering control (autonomous v. guided). An engineering notebook outlining project management, tasks scheduled and tasks completed will be required and used for assessing overall score. Self- and peer-to-peer assessments will also be used in your overall score.

Project 2-BSE Students. Develop a treatment system for sugary waste. Consider the following scenario: A newly sited confectionery plant will produce 570 $m^3\ d^{-1}$ of liquid wastewater, with an organic fraction primarily composed of sucrose, such that $[COD]_{avg} = 15\ g\ L^{-1}$. The municipal wastewater treatment authority cannot accept the entire load, and has requested that the plant owners install technology to reduce the COD mass load by at least 70%. Your consulting company is one of several that have been enlisted to develop a treatment technology for the plant. Your client, the confectionery plant owners, have decided to organize a competition among engineering firms, to determine which firm will be retained for the final system design and construction phases of the project. A complete set of rules and regulations for this competition will be available. Scoring based on several key performance indicators including cost of treatment. An engineering notebook outlining project management, tasks scheduled and tasks completed will be required and used for assessing overall score. Self- and peer-to-peer assessments will also be used in your overall score.

Course Number and Name	AE 271. Engineering Applications of Parametric Solid Modeling.
Credits and Contact Hours	(1-2) Cr. 1. F.S.
Instructor/Course Coordinator	James Shahan
Textbook and supplemental materials	Engineer. Design W/SolidWorks 2011-W/CD Planchard 2011
Catalog Description	Eight week-course. Creating, editing, and documenting part and assembly models using Solidworks.
Pre-requisites	ENGR 170 or TSM 116 or equivalent
Required/Elective/Selected	271 or 272 required
Purpose	The purpose of this course is to help students develop key workplace competencies necessary and sufficient for an engineering / technology graduate to be successful. These competencies include technical knowledge, computer skills, continuous learning, and communication.
Specific Outcomes	Expanded your knowledge of the features and capabilities of parametric solid modeling software An ability to utilize the software for the communication of design ideas – ABET Criteria 2000 (g) An ability to utilize the software for engineering problem solving - ABET Criteria 2000 (g) The opportunity to explore new / advanced features of the software – ABET Criteria 2000 (k) Created and visualized geometric models of parts and assemblies– ABET Criteria 2000 (c)
Topics	See below

	Date	Topics	The Basics	Assigned Steps	Intermediate	Assigned Steps	Due
1	8/22	Intro	Project 1: Parts File Management Plate	 1-58 59-241	Project 4: Extrude / Revolve Files Managemet (Project 1) Templates Battery Battery Plate	 1-58 1-43 44-167 168-251	8/24
2	8/24	Printouts	Rod	242-447	Lens Bulb	252-428 429-566	8/29
3	8/29	Details: Parts and Assemblies	Guide	448-620	Project 5: Sweep / Loft /other O-ring Switch Lenscap	 1-70 71-163 164-310	8/31
4	8/31		Project 2: Assemblies Guide-Rod Customer	 1-448 449-549	Housing	211-709	9/7
	9/5	No Class – University Holiday					
5	9/7	Drawing Details	Project 3: Drawings Template Guide Drawing	 1-137 138-450	Templates / Lens and Bulb Battery and Plate Cap and Lens	710-781 782-810 811-874	9/12
6	9/12	Review	Assembly Drawing	451-541	Flashlight	875-975	9/19
7	9/14	In-Class Problem I (Part Model and Drawing)					
8	9/19	Portfolio Assignments (Choose 1: Tutorials / Exercises / Reverse Engineering / Project6)					
9	9/21	Portfolio Progress Report					9/21
10	9/26	Work on Portfolio Assignments					
11	9/28	Portfolio Progress Report					9/28
12	10/3	Work on Portfolio Assignments					
13	10/5	Portfolio Progress Report					10/5
14	10/10	Finish Portfolio					
15	10/12	In-Class Problem II (Parts / Assemblies / Drawings) - Portfolio Due					

Course Number and Name	AE 272. Parametric Solid Models, Drawings, and Assemblies Using Pro/ENGINEER.
Credits and Contact Hours	(1-2) Cr. 1. F.S.
Instructor/Course Coordinator	James Shahan
Textbook and supplemental materials	"Pro/ENGINEER Wildfire 5.0 Tutorial and MultiMedia CD" by Roger Toogood, SDC Publications
Catalog Description	Eight week-course. Applications of Pro/ENGINEER software. Create solid models of parts and assemblies. Utilize the solid models to create design documentation: standard drawing views, dimensions, and notes.
Pre-requisites	Prereq: ENGR 170 or TSM 116 or equivalent
Required/Elective/Selected	271 or 272 required
Purpose	The purpose of this course is to help students develop key workplace competencies necessary and sufficient for an engineering / technology graduate to be successful. These competencies include technical knowledge, computer skills, continuous learning, and communication.
Specific Outcomes	Expanded your knowledge of the features and capabilities of parametric solid modeling software Ability to utilize the software for the communication of design ideas –ABET Criteria 2000 (g) Ability to utilize the software for engineering problem solving -ABET Criteria 2000 (g) Opportunity to explore new/advanced features of the software –ABET Criteria 2000 (k) Created and visualized geometric models of parts and assemblies–ABET Criteria 2000 (c)
Topics	See below

Week	Dates	Topics	Reading	Homework
1	10/17 10/19	1. lab intro / User Interface, …… 2.Creating a Simple Object (Part I) Tutorial •Portfolio Assignments	Fig. 2-39	
2	10/24 10/26	3. Simple Object (Part II) Tutorial / "Quick" Printing: •Portfolio: Requirements / Assignments 4. Revolved Protrusions, Mirror Copies, …Tutorial •Portfolio Assignments 5. Modeling Utilities and the 3 R's Tutorial •Portfolio Assignments	Fig. 3-43 Fig. 4-24	
3	10/31 11/2	6. Datums and Sketcher Tools In-Class Exercise I - Part Model/Draw	Fig. 6-27	
4	11/7 11/9	7. Patterns and Copies Tutorials •Portfolio Assignments	Figs:21,22,29, 34	
5	11/14 11/16	8. Engineering Drawings Tutorials •Portfolio Assignments 9. Assembly Fundamentals Tutorial •Portfolio Assignments	Fig. 8-40 Fig. 9-40	
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6	11/28 11/30	Work on Portfolio (Lesson 10 or 11) In-Class Exercise II - Assembly Model/Draw		
7	12/5 12/7	•Portfolio Assignments Submit Portfolio		

Course Number and Name	AE 301. Leadership and Ethics Seminar (last offered Spring 2010)
Credits and Contact Hours	(1-0) Cr. 1. F.S
Instructor/Course Coordinator	Amy Kaleita
Textbook and supplemental materials	None.
Catalog Description	Eight week course. Leadership and ethics experiences through case studies and seminar presentations by practitioners. Relationship of workplace competencies to leadership and ethics; portfolios.
Pre-requisites	AE 201.
Required/Elective/Selected	Was required – however no longer offered
Purpose	The purpose of this course is to help in your development to become a practicing professional.
Student Learning Objectives	Upon the completion of this course, you should have enhanced your: Understanding of professional and ethical responsibility; recognition of the need for, and ability to engage in life-long learning; ability to communicate effectively through the development of student electronic portfolios for the demonstration of workplace competencies; ability to create, plan and conduct your professional career
Specific Outcomes	an ability to apply knowledge of mathematics, science and engineering an ability to design and conduct experiments, as well as to analyze and interpret data an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability an ability to function on interdisciplinary teams an ability to identify, formulate and solve engineering problems an understanding of professional and ethical responsibility an ability to communicate effectively the broad education necessary to understand the impact of engineering solutions in a global, economic, environ-mental, and societal context a recognition of the need for, and the ability to engage in, life-long learning a knowledge of contemporary issues an ability to use the techniques, skills and modern engineering tools necessary for engineering practice proficiency in mathematics, through differential equations, and relevant engineering sciences consistent with the discipline knowledge of appropriate agricultural, and/or biological sciences, and/or natural resource topics competencies in relevant fields such as: biological materials, computer and automatic control systems, information systems, machine systems, modified environment design, natural resource systems, processing systems, and structural design
Topics	See below

Week	Dates	Topics	Reading	Homework
1	1/12	Course introduction, overview of portfolio assignment		
2	1/14	Employee evaluation & portfolio development		
Project Management				
3	1/19	Introduction to project management		
4	1/21	Stakeholder Analysis		
5	1/26	Project Statement of work (SOW)		
6	1/28	Work breakdown structures		
7	2/2	Teambuilding		
8	2/4	Communication		
9	2/9	Measuring project software		
10	2/11	Project management software		
11	2/16	Project Problem-solving		
Professional Ethics				
12	2/18	Introduction to professional ethics; Ethics case study 1		
13	2/23	Resolving ethics problems; Ethics case study 2		
14	2/25	Ethics case study 3		
15	3/2	Ethics case study 4		
16	3/4	Wrap-up.		

Course Number and Name	AE 316. Applied Numerical Methods for Agricultural and Biosystems Engineering
Credits and Contact Hours	(2-2) Cr. 3. F.
Instructor/Course Coordinator	Lie Tang
Textbook and supplemental materials	Numerical Methods for Engineers, 6th ed. S.C. Chapra & R. P. Canale Course information, homework and lab assignments and some solutions will be posted on WebCT
Catalog Description	Computer aided solution of agricultural engineering problems by use of numerical techniques and mathematical models. Systems analysis and optimization applicable to agricultural and biological systems.
Pre-requisites	ENGR 160, Math 266
Required/Elective/Selected	Required
Specific Outcomes	Ability to apply knowledge of mathematics, science, and engineering Ability to identify, formulate, and solve engineering problems Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Topics	See below

Week	Dates	Topics	Reading	Homework
1	8/23 8/25	Introduction Introduction to numerical methods and sources of error Lab 0: VBA warm-up programming exercise		
2	8/30 9/1	Visual Basic for Applications (VBA) review Roots of non-linear algebraic function: Bracketing methods (Bisection and False Position) Lab 1: NM Introductory and VBA Refreshing Lab		HW 1
3	9/6 9/8	Roots of non-linear algebraic functions: open methods (Fixed point it-eration, Newton-Raphson, Secant) Roots of non-linear algebraic functions: open methods (Fixed point it-eration, Newton-Raphson, Secant) Lab 2: VBA - User Interface Design in Excel		HW 2
4	9/13 9/15	Basics of Linear Algebra and Simple Gaussian Elimination Gaussian Elimination with Partial Pivoting Lab 3: Roots of Equations - Estimating Bacterial Levels in Skunk River		
5	9/20 9/22	Gauss-Seidel Method Engineering applications Lab 4:Gaussian Elimination - Solving a Linear Equation System		HW 3
6	9/27 9/29	Least Squares Regression Polynomial regression		
7	10/4 10/6	Multiple linear regression Polynomial interpolation Lab 5: Matrix Operations for Encryption		HW 4
8	10/11 10/13	Spline interpolation		HW 5
9	10/18 10/20	Integration: Trapezoidal Rule Integration: Simpson's Rule Lab 6: Interpolation (Lagrangian) - Nitrogen Rate Data		HW 6
10	10/25 10/27	Integration: Simpson's Rule Integration: Gauss Quadrature Rule Lab 7: Interpolation (3rd Order Splines) - Nitrogen Rate Data		
11	11/1 11/3	Integration: Gauss Quadrature Rule Numerical Differentiation Lab 8: Integration – Survey the Area with Irregular Boundaries		HW 7
12	11/8 11/10	Numerical Differentiation Numerical solution for ODEs		
13	11/15 11/17	Euler, Midpoint and Heun's Methods Runge-Kutta Methods (2nd order) Lab 9: ODE - A Transient Tank System with ODEs		
14	11/29 12/1	Runge-Kutta Methods (3rd and 4th order) Constrained Optimization (Linear Programming)		HW 8
15	12/6 12/8	Constrained Optimization (Linear Programming) (dead week) Review (dead week)		
16	Finals	Finals Week		

Course Number and Name	AE 325. Biorenewable Systems
Credits and Contact Hours	(3-0) Cr. 3. F.
Instructor/Course Coordinator	Tom Brumm
Textbook and supplemental materials	None.
Catalog Description	Converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, processes, products, co-products, economics, and transportation/logistics.
Pre-requisites	Course prerequisites are Econ 101, Chemistry 155 or higher, and Math 140 or higher. From these courses you are expected to understand the basics of economics and chemistry, and to be able to make extensive algebraic calculations and unit conversions. If you do not have these prerequisites, see Dr. Brumm to get permission to remain in the course.
Required/Elective/Selected	Elective
Specific Outcomes	Identify and discuss bioeconomy drivers of change. Describe, discuss, and analyze major components of biorefining products, processes, feedstock production, and co-products. Understand and apply firm- and market-level economics of biorenewable products to analyze profitability, technological change, competition, trade flows and public policy. List different types of transportation modes, explain cost/service tradeoffs and use this knowledge to describe critical biorenewable issues.
Topics	See below

Week	Dates	Topics	Reading	Homework
1-2		Drivers of Change: global energy use; climate change; politics and security; economic development		
3		Fundamental sciences of biorenewables: chemistry, thermodynamics, energy		
4-8		Biorenewable products and processes: bioprocessing; biofuels; biobased products, co-products		
9-10		Biomass feedstock production systems		
11-13		Biorenewable Economics: markets, impacts/tradeoffs, public policy		
14-15		Transportation and logistics, marketing		
16		Finals Week		

Exams - There are five (5) closed-book exams, roughly one every three weeks.
F2F Students (Sections A and B) will take exams in class: Sep 13, Oct 4, Oct 25, Nov 15 and a take-home exam due final week.
Online students (Sections XH and XW) will take exams under the supervision of an approved proctor in the three days following the F2F dates of the exams: Sep 14-16, Oct 5-7, Oct 26-28, Nov 16-18 and a take-home exam due final week.
Online students (Section XH): You are a student at a university in the AG*IDEA Consortium. A proctor will be arranged by the coordinating professor at your university (Dr. John Slocombe at K-State, Dr. Leon Schumacher at Missouri, and Dr. Jack Schinstock at UNL). If you need to arrange for a different proctor, contact Dr. Brumm.
Online students (Section XW): Exams may be taken during a designated time period for which you will sign up via Bb Learn approximately a week ahead of the examination. Exams will be administered in the LAS Online Testing Center in 60 Carver Hall, Mon-Thu 8am to 7pm (doors locked 6:30pm) and Fri 8am to 6pm (doors locked 5:30pm). All exams must be completed by closing time. (http://www.lasonline.iastate.edu/index.php/services/las-testing-center). If you are unable to take the exams in the LAS Online Testing Center (you are not in Ames), arrange for a proctor by submitting this form to Dr. Brumm: http://www.agde.iastate.edu/forms/ProctorForm.pdf.

Weekly Assignments - Each week there will be assignments that are a mixture of readings, numerical problems and reflections. They will be completed and/or submitted through Bb Learn. In-class students (sections A & B) may be submitting assignments during the regular class time. Online students will occasionally need to turn in hand-written assignments and will need access to a scanner to submit them electronically through Blackboard Learn.
Team Problems - F2F students (sections A & B) will do collaborative work in-class, a.k.a., "team problems." Online students (sections XH & XW) are expected to do the same assignments with no restriction relative to collaboration with others or use of outside resources.
Semester Project - The semester project will be either a poster or paper examining an issue relative to biorenewables.
F2F students (sections A & B): The semester project is a poster. You will work in assigned teams. A public poster session will be held during the final examination period at which time you will present your poster as a team.
Online students (sections XH & XW): You have a choice of a poster (completed individually or in a team of other online students of your choosing) or a paper (completed individually). With a poster, you may participate in the poster session if you wish.

Course Number and Name	AE 340. Functional Analysis and Design of Agricultural Field Machinery
Credits and Contact Hours	(2-2) Cr. 3. F.
Instructor/Course Coordinator	Stuart Birrell
Textbook and supplemental materials	"Engineering Principles of Agricultural Machines". Ajit K. Srivastava, Carroll E. Goering, Roger P. Rohrbach, Dennis R. Buckmaster.
Catalog Description	Principles of operation, design, selection, testing and evaluation of agricultural field machinery and systems. Functional and mechanical performances. Crop and soil interaction with machines. Machine systems, including land preparation, crop establishment, crop protection, harvesting and post-harvest, materials handling systems.
Pre-requisites	AE 110, 203, 216
Required/Elective/Selected	Required for PME option
	To help students understand the operation, design and development concepts and principles of modern agricultural machinery. Provide students with fundamental engineering and mathematical knowledge to design and evaluate the performance of agricultural machines.
Specific Outcomes	gained fundamental knowledge in analyzing the basic operational principles, characteristics and mechanisms of agricultural machinery Improve your ability in understanding the parameters involved in the design and operational processes of agricultural machinery systems. specifically, learned how to analyze and synthesize tillage, planting, crop protection, harvesting, and material handling mechanisms, as well as management skills in farm power machinery in terms of field efficiency and machinery costs been acquainted with the emerging technologies adopted in modern agricultural machinery
Topics	See below

Week	Dates	Topics	Reading	Lab
1	8/23 8/25	Intro Machinery Performance	Ch. 15 EPAM	
2	8/30 9/1	Machinery Performance Cost Management		
3	9/6 9/8	Cost Management Cost Management		Crystal Ball 1
4	9/13 9/15	Mechanics of Soil Mechanics of Soil	Ch. 8 EPAM	Crystal Ball 2
5	9/20 9/22	Mechanics of Soil Mechanics of Soil		Crystal Ball 3
6	9/27 9/29	Planters Planters	Ch. 4 EPAM	Project
7	10/4 10/6	Combines Combines	CH.9 EPAM	Project
8	10/11 10/13	Chemical App. & Sprayers Chemical App. & Sprayers		Project
9	10/18 10/20	Hay and Forage Hay and Forage		Project Presentations
10	10/25 10/27	Power Transmission Power Transmission		CB Project
11	11/1 11/3	Power Transmission Conveying of Materials		CB Project
12	11/8 11/10	Conveying of Materials Conveying of Materials	Ch. 9 EPAM	CB Project
13	11/15 11/17	Conveying of Materials Conveying of Materials		CB Project
		Thanksgiving Break		
14	11/29 12/1	Exam 2 Other		
15	12/6 12/8	Presentations Presentations		
16	Finals Week			

Course Number and Name	AE 342. Agricultural Tractor Power.
Credits and Contact Hours	(2-3) Cr. 3. S.
Instructor/Course Coordinator	Stuart Birrell
Textbook and supplemental materials	Off Road Vehicle Engineering Principles, Goering, C.E., M.L. Stone, D.W. Smith, and P.K. Turnquist. St. Joseph, Mich.: ASAE.
Catalog Description	Thermodynamic principles and construction of tractor engines. Fuels, combustion, and lubrication. Kinematics and dynamics of tractor power applications; drawbar, power take-off and traction mechanisms. Non-major graduate credit.
Pre-requisites	Ch E 381 or M E 231
Required/Elective/Selected	Required for PME option
Purpose	To help students understand the principles of internal combustion engines, engine testing and their application in agricultural tractors. To provide students with a fundamental understanding of the concepts of traction and chassis mechanics. Improve student's communication/teamwork skills. Provide exposure to problems that require judgment decisions and justification of those decisions, even in the case of incomplete information.
Specific Outcomes	Understand the terminology and basic design principles governing the performance of an engine Exhibit a fundamental understanding of the concepts of traction and chassis mechanics including the interaction between weight transfer, slip and traction, based on the Wismer-Luth and Brixius equations. Understand planar chassis mechanics and limitations of tractor performance based on traction, stability and/or engine torque. Understand the power flows through a tractor from the engine, through the power train and development of drawbar power. Complete the design/modeling of a "virtual tractor" with teams responsible for individual subsystems, and co-ordination between teams to ensure completion of the overall design project
Topics	See below

Week	Dates	Topics	Reading	Labs
1	1/9 1/12	Introduction Work/Energy/Power	Ch.2	No Lab
2	1/16 1/18	Holiday Engine Performance		No Lab
3	1/23 1/25	Engine Cycles	Ch.4	Engine Friction Tests (formal report
4	1/30 2/1	Fuels Fuels/Combustion	Ch.5	Engine Performance Tests (formal report)
5	2/6 2/8	Engine Design	Ch.6	Sec. 1 Engine Construction Sec 2. No Lab
6	2/13 2/15	Engine Design		Sec 1.Engine Construction Sec 2. Engine Construction
7	2/20 2/22	Turbocharging/Aftercooling Weight Transfer	Ch.7	Sec 1. No Lab Sec 2. Engine Construction
8	2/27 2/29	Weight Transfer Exam 1	Ch.8	TBA
9	3/5 3/7	Review Weight Transfer		Projects
	3/12-16	SPRING BREAK		
10	3/19 3/21	Tires/Traction Traction	Ch.13	Team Project Meeting
11	3/26 3/28	Tractive Performance Chassis Mechanics	Ch.14	Traction Lab
12	4/2 4/4	Clutches/Transmissions Transmissions/Differentials	Ch.12	Transmission Lab
13	4/9 4/11	Hydraulics	Ch.11	Project
14	4/16 4/18	Electronics, CAN Final Reports	Ch. 10	Visit Deere
15	4/23 4/25	Exam 2 Open		Team Project Meeting
16	Finals Week	Additional Topics		

Course Number and Name	AE 363. Agri-Industrial Applications of Electric Power and Electronics
Credits and Contact Hours	(3-2) Cr. 4. F.
Instructor/Course Coordinator	Carl Bern
Textbook and supplemental materials	Electricity for Agricultural Applications, Bern and Olson, 2002.
Catalog Description	Single phase and three phase circuit design. Electrical safety. Electric motors and controls. Programmable logic controllers. Digital logic, instrumentation and sensors. Non-major graduate credit.
Pre-requisites	Phys 222
Required/Elective/Selected	Required
Specific Outcomes	
Topics	See below

Week	**Dates**	**Topics**	**LAB**	**Homework**
1	8/23 8/25	Intro, basic electricity (Ch. 1) Electrical safety, 3-wire circuits (Ch. 1, 3)	Oscilloscope basics (Lab 21)	
2	8/30 9/1	Ethics and electrical safety RLC circuits (Ch. 2)	Electrical circuits (Lab 2)	
3	9/6 9/8	RLC circuits (Ch. 2) Power factor correction (Ch. 2)	Ground-fault interrupters (Lab 3)	
4	9/13 9/15	Conductor design (Ch. 5) Conductor design (Ch. 5	Wiring practices (Lab 4)	
5	9/20 9/22	3-phase circuits (Ch. 4) 3-phase circuits (Ch. 4)	3-phase circuits(Lab8)	
6	9/27 9/29	**HOUR EXAM** Motor applications (Ch. 10)	Wiring design (Lab 22)	
7	10/4 10/6	Motor controls (Ch. 10)	Motor characteristics (Lab 10)	
8	10/11 10/13	Motor applications (Ch. 10) Motor applications (Ch. 10)	Motor control circuits (Lab 11)	
9	10/18 10/20	Motor applications (Ch. 10) Motor circuits (Ch. 10)	Digital circuit components (Lab 12)	
	10/25 10/27	Stray Voltage (Ch. 14) Digital circuits (Ch. 13)	Digital circuit design (Lab 13)	
10	11/1 11/3	Digital circuits (Ch. 13) HOUR EXAM		
11	11/8 11/10	Lie Tang begins Part 2		
12	11/15 11/17			
13	11/22-24	No Class		
14	11/29 12/1			
15	12/5 12/7			

Course Number and Name	AE 388. Sustainable Engineering and International Development.
Credits and Contact Hours	(2-2) Cr. 3. F.
Instructor/Course Coordinator	Say Kee Ong Brian Steward
Textbook and supplemental materials	None. Lecture notes and readings will be made available on WebCT
Catalog Description	Multi-disciplinary approach to sustainable engineering and international development, sustainable development, appropriate design and engineering, feasibility analysis, international aid, business development, philosophy and politics of technology, and ethics in engineering. Engineering-based projects from problem formulation through implementation. Interactions with partner community organizations or international partners such as nongovernment organizations (NGOs). Course readings, final project/design report.
Pre-requisites	Junior classification in engineering
Required/Elective/Selected	Elective
Specific Outcomes	Describe, discuss and compare key concepts of sustainability, sustainable development and sustainable engineering Describe, discuss, and evaluate the use of sustainable engineering principles in the design and implementation of water and waste systems, energy systems, agricultural and food systems, and building and infrastructure systems Evaluate the sustainability of technologies for developed and developing societies Perform more effectively as a member of a design team Communicate more effectively through progress reports, short presentations, final project reports, and formal project presentations
Topics	See below

Week	**Dates**	**Topics**	**Reading**	**Home -work**
1	Aug. 22,23,24	Introductions, Syllabus, Course Logistics, Pre-Course Survey [SKO, BS] Past Projects, Project Opportunities, Project Expectations [SKO, BS] Sustainability Concepts > Global Sustainability Challenges/Issues [SKO]		
2	Aug. 29,30,31	Sustainability Concepts > Appropriate Technology [BS] Team Formation; Appropriate Technology exercises[BS] Sustainability Concepts > Engineering Design Process [SKO]		
3	Sep. 5,6,7	University Holiday Sustainability Concepts > Understanding Team Dynamics [BS] Sustainability Concepts > What is sustainability? and historical background [SKO]		
4	Sep. 12,13,14	Sustainability Concepts > Sustainable Engineering and Development [BLS] Sustainability Concepts Exercise; Project Discussions [SKO, BS] Sustainability Concepts > Local Sustainability Challenges/Issues – Guest: Merry Rankin,		
5	Sep. 19,20,21	Energy Systems > Solar Power – Guest: Dr. Sumit Chaudhary, ECpE [SKO] Module 1 Quiz; Team Reports [SKO] Energy Systems > Photovoltaic Power Systems – Guest: Dr. Sumit Chaudhary, ECpE		
6	Sep. 26,27,28	Energy Systems > Wind Energy [BS] Project Discussions [BS] Energy Systems > Wind Power Systems [BS]		
7	Oct. 3,4,5	Biorenewable Energy Systems > Energy from Biomass - Guest: Mr. Ajay Shah [BS] Module 2 Energy Systems Quiz; Project Discussions [SKO, BS]		

		Biorenewable Energy Systems - Guest: Mr. Ajay Shah [SKO]		
8	Oct. 10,11,12	Biorenewable Energy Systems - Guest: Mr. Ajay Shah [BS] Project Discussions [SKO, BS] Biorenewable Energy Systems - Guest: Mr. Ajay Shah [SKO]		
9	Oct. 17,18,19	Sustainability Tools > Life Cycle Assessment, Guest: Dr. Kurt Rosentrater [BS] Module 3 Biorenewable Energy Systems Quiz; Mid-Term Presentation [SKO, BS] Sustainability Tools > Life Cycle Assessment, Guest: Dr. Kurt Rosentrater [SKO]		
10	Oct. 24,25,26	Sustainability Tools > Life Cycle Assessment, Guest: Dr. Kurt Rosentrater [BS] Energy Systems > Guest Speaker: Wes Meier, EOS International [BS] Sustainability Tools > Life Cycle Assessment, Guest: Dr. Kurt Rosentrater [SKO]		
11	Oct. 31,1,2	Water and Waste Systems > [SKO] Module 4 LCA Quiz; Project Discussions [[SKO] Water and Waste Systems > [SKO]		
12	Nov. 7,8,9	Water and Waste Systems > [SKO] Water and Waste Systems Exercise [SKO] Water and Waste Systems > [SKO]		
13	Nov. 14,15,16	Building and Infrastructure Systems, Guest: Ms. Kerry Dixon-Fox, ISU FPM [SKO] Module 5 Water Quiz; Team Reports [SKO, BS] Building and Infrastructure Systems, Tour of LEED Building led by Ms. Dixon-Fox, [SKO]		
14	Nov. 28,29,30	Agric and Food Systems > Sustainable Agriculture [BS] Module 6 Building & Infrastructure Systems Quiz; Project Discussions [SKO, BS] Agric and Food Systems [BS]		
15	Dec. 5,6,7	Agric and Food Systems, Course Evaluation [BS] Project Presentations [SKO, BS] Project Presentations [SKO, BS]		

Course Number and Name	AE 401. Professionalism Seminar (last taught Fall 2009)
Credits and Contact Hours	(1-0) Cr. 1. F.S.
Instructor/Course Coordinator	Michelle Soupir
Textbook and supplemental materials	None.
Catalog Description	Eight week course. Examination of professionalism in the context of engineering and technology. Time, project, and personnel management. Communications and professional portfolios. Professional licensure. Transition to professional careers.
Pre-requisites	AE 301
Required/Elective/Selected	Was required – however no longer offered
Purpose	To enhance your abilities as a practicing professional
Specific Outcomes	ability to create, plan and conduct your professional career, ability to communicate effectively, recognition of the need for, and ability to engage in, lifelong learning, ability to understand professional and social responsibilities, and respect for diversity and a knowledge of contemporary professional, societal, and global issues.
Topics	

Course Number and Name	AE 403. Modeling and Controls for Agricultural Systems.
Credits and Contact Hours	(2-2) Cr. 3. Alt. S
Instructor/Course Coordinator	Brian Steward
Textbook and supplemental materials	Palm, W. J. 2009. System Dynamics. 2nd Ed. McGraw Hill. Other book chapters available on WebCT
Catalog Description	Modeling dynamic systems with ordinary differential equations. Introduction to state variable methods of system analysis. Analysis of mechanical, electrical, and fluid power systems. Analytical and numerical solutions of differential equations. Introduction to classical control theory. Feedback and stability examined in the s domain. Frequency response as an analytical and experimental tool. MATLAB will be used throughout the course for modeling.
Pre-requisites	Math 266, Elementary Differential Equations, and AE 363, Agri-Industrial Applications of Electric Power and Electronics, or EE 441, Introduction to Circuits, Instruments, and Electronics.
Required/Elective/Selected	Elective
General Course Objectives	AE 403/503 has three general course objectives: To help students gain proficiency in modeling dynamics systems. To assist student in applying modeling and simulation software. To help students understand basic control theory.
Specific Outcomes	Develop mathematical models of engineering systems. Simulate the dynamic response of a system. Understand terms describing dynamic systems. Determine the stability of a system. Determine the frequency response of a system. Use advanced physical modeling tools. Design simple controllers for engineering systems. Use Matlab and Simulink to simulate dynamic systems and control systems
Topics	See below

Week	Dates	Topics	Reading	Homework
1	Jan. 9	Introduction to AE 403/503 Systems and System Elements Engineering Systems Analogies	Ch. 1 and Supplemental	Problem Set 1
2	Jan. 16	Modeling Mechanical Systems	Ch. 2 and 4	Problem Set 2 Lab intro to Matlab
3	Jan. 23	Modeling Mechanical Systems		Problem set 3
4	Jan. 30	Different System Models	Ch. 5, 3, 9	Lab 2
5	Feb. 6	Matlab/Simulink/Numerical Solutions	Ch. 5 and supplemental	Problem Set 4 Lab 3
6	Feb. 13	Analytical Solutions	Ch. 3,9, and notes	Lab 4 Exam 1
7	Feb. 20	Modeling Electrical and Electromechanical Systems	Ch. 6	Problem set 5 Lab 5
8	Feb. 27	Electrical Systems		503 Project Proposals
9	Mar. 6	Fluid Systems	Ch. 7 and supplemental	Problem Set 6
	Mar. 13-19	SPRING BREAK		
10	Mar. 20	Fluid Systems		Lab 6
11	Mar. 27	Physical Modeling Approaches	Fritzson, P Ch. 1	Problem set 7 Exam 2
12	Apr. 3	Physical Modeling Software	Fritzson, P Ch. 2	Problem Set 8 Lab 7
13	Apr. 10	Frequency Analysis	Ch. 8	
14	Apr. 17	Control Systems Modeling and Analysis	Ch. 10	Problem Set 9 Lab 8
15	Apr. 24	Control System Design	Ch. 11	
16	Finals Week			

Course Number and Name	AE 404. Instrumentation for Agricultural and Biosystems Engineering.
Credits and Contact Hours	(2-2) Cr. 3. F.
Instructor/Course Coordinator	Steven J. Hoff
Textbook and supplemental materials	Manual, Transducer Based Instrumentation (S.J. Hoff, 2011)
Catalog Description	Interfacing techniques for computer-based data acquisition and control systems. Basic interfacing components including A/D and D/A conversion, signal filtering, multiplexing, and process control. Sensors and theory of operation applied to practical monitoring and control problems.
Pre-requisites	AE 363 (Agri-Industrial Applications of Electric Power) CprE 210 (Introduction to Digital Techniques and Circuits) CPRE330 (Integrated Electronics) EE442 (Introduction to Circuits and Instruments)
Required/Elective/Selected	Required
Specific Outcomes	Develop simplified logic circuits for performing practical tasks. Develop hardware for storing logic states. Interface and software control of PC-based CPU architecture. Read and understand integrated circuit specification sheets. Develop signal conditioning hardware to synchronize transducer output to A/D input requirements. Develop hardware filtering of analog signals to remove the effects of unwanted frequencies. After completing this course, the student should be able to: Develop simplified logic circuits for performing practical tasks. Develop hardware for storing logic states. Interface and software control of PC-based CPU architecture. Read and understand integrated circuit specification sheets. Develop signal conditioning hardware to synchronize transducer output to A/D input requirements. Develop hardware filtering of analog signals to remove the effects of unwanted frequencies. Relationship to Program Objectives (Criterion 2): This course contributes toward attainment of Program Objectives 1, 2, and 5 as follows: 1. Principle of operation for common transducers introduced and the requirements for measurement using A/D systems to reduce quantization error studied in detail. Visual Basic programming skills used for communicating with PC-based data acquisition and control systems. 2. Intensive design project involves students of various specialty areas. 5. Lab intensive hands-on laboratory assignments provide the foundation for this course. Contribution to Professional Component (Criterion 4): Students are involved in an intensive design project throughout the semester. Design projects are open-ended with few restrictions.
Topics	See below

Week	Dates	Topics	Reading	Homework
1		Numbering systems.		
2		Boolean logic and algebra.		
3		Digital design, logic circuits.		
4		Data latching, flip-flops.		
5		Software development using Visual Basic.		
6		Input/output port design and control		
7		D/A conversion		
8		A/D conversion		
9		Signal Multiplexing		
10		Signal Conditioning (op-amps, wheatstone, bridge, voltage dividers, etc.		
11		Signal filtering (hardware, software).		
12		Transducer-based sensors.		
13		Data acquisition and control.		

Course Number and Name	AE 408. GIS and Natural Resources Management.
Credits and Contact Hours	(2-2) Cr. 3. F.
Instructor/Course Coordinator	Udoyara Sunday Tim
Textbook and supplemental materials	ArcGIS 9.2/9.3 will be utilized for the course. ArcGIS is a product of the Environmental Systems Research Institute (ESRI) in Redlands, CA. The software is available in the classroom and a number of student computing laboratories across campus.
Catalog Description	Introduction to fundamental concepts and applications of GIS in natural resources management with specific focus on watersheds. Topics include: basic GIS technology, data structures, database management, special analysis, and modeling; visualization and display of natural resource data. Case studies in watershed and natural resource management using ArcView GIS.
Pre-requisites	Working knowledge of computers and Windows environment.
Required/Elective/Selected	Elective
Specific Outcomes	Demonstrate an understanding of fundamental concepts and principles of GIS Demonstrate competence in the use of various ESRI products including ArcGIS and ArcIMS Understand different techniques and technologies for acquiring natural resources data Conduct spatial and logical queries on geodatabases Demonstrate a working knowledge of GIS strengths and weaknesses in natural resources management Develop and communicate the results of GIS analysis a non-technical audience Demonstrate proficiency in using quantitative GIS-based analysis in natural resources management Gain a practical understanding of GIS concepts, technical issues, and applications Learn where GIS fits in the global information technology infrastructure, how GIS is unique, and why it is important Know how to create and manipulate natural resource data, query a GIS database, and present data clearly and efficiently using a variety of formats Gain practical experience using ArcGIS and related software and hardware
Topics	See below

Week	Dates	Topics	Reading	Lab
1		What is GIS?		(a) Getting started with GIS (for ArcGIS 10) (b) Learning ArcGIS Desktop
2		GIS Data Models I - Vector		(a) Working with map topology in ArcGIS (b) Creating and editing Geodatabase topology with ArcGIS desktop
3		GIS Data Models II - Raster		(a) Basics of raster data (b) Displaying raster data using ArcGIS 10
4		Acquiring Natural Resource Data for GIS		Creating and integrating data for natural resource applications
5		Geocoding and Coordinate Systems		(a) Basics of geographic coordinate systems (b) Understanding map projections and coordinate systems
6		**Exam 1**		
7		Spatial Data Quality		(a) Editing in ArcGIS desktop (b) Creating and editing geodatabase features with ArcGIS desktop
8		Managing Attribute Data		(a) Basics of geodatabase (b) Understanding GIS queries (c) Creating, editing and managing geodatabases for ARCGIS desktop
9		GIS Data Structures and Algorithms I – Vector		Turning data into information using ArcGIS 10
10		GIS Data Structures and Algorithms II - Raster		(a) Working with raster in ArcGIS desktop (b) Organizing raster data using ArcGIS 10
11		Exam 2		
12		Algorithms for Surfaces and Volumes		(a) Deriving rasters for terrain analysis using ArcGIS 10 (b) Introduction to surface modeling using ArcGIS 10
13		Algorithms for Surfaces and Volumes		(a) Creating 3D data using ArcGIS 10 (b) 3D analysis of surface and features using ArcGIS 10
14		Thanksgiving Break		
15		Geospatial Data Mining		(a) GIS for humanitarian mine action (b) Geoprocessing with ArcGIS desktop
16	Finals Week	Exam 3		

Course Number and Name	AE 410. Electronic Systems Integration for Agricultural Machinery and Production Systems
Credits and Contact Hours	(2-2) Cr. 3. S.
Instructor/Course Coordinator	Matthew Darr
Textbook and supplemental materials	Microchip dsPIC30F5013 Datasheet, Microchip Inc. Software Compiler Manual, provided by instructor Lecture Outlines: Available on WebCT
Catalog Description	System architecture and design of electronics used in agricultural machinery and production systems. Emphasis on information technology and systems integration for automated agriculture processes. Design of Controller Area Network (CAN BUS) communication systems and discussion of relevant standards (ISO 11783 and SAE J1939). Application of technologies for sensing, distributed control, and automation of agricultural machinery and electro-hydraulic systems will be emphasized.
Pre-requisites	AE 363 or equivalent
Required/Elective/Selected	Elective
Purpose	To enhance your abilities as a practicing professional
Specific Outcomes	Upon successfully completing this course, students should have gained or improved: Mastery of the system design and technologies required by fully integrated electrical, mechanical, and fluid systems. Ability to integrate hardware and software components to achieve high performance, distributed sensor networking to support agricultural information technology. Ability to conduct, analyze and interpret experiments. Proficiency in implementation of CAN Bus networked systems for distributed agricultural controls. Knowledge of ISO 11783 agricultural vehicle systems communication protocol and understand its role in advanced machine design.
Topics	See below

Week	Dates	Topics	Reading	Homework
		Fundamentals of Agricultural Electronic Systems Integration		
		Role of Software in Systems Integration		
		Control Implementation for Agricultural Systems		
		Interfacing Secondary Agricultural Electronic Systems		
		Design and Analysis of Communication Networks (CAN Bus)		
		Electronic Hardware Design for Agricultural Environments		

Assignments:
This course will have an intensive laboratory section that will challenge course members and provide hands on application of lecture material. Each lab report should detail the procedure, goals and outcomes of the particular lab as well as provide a clear explanation to any relevant questions. Any software code used must be provided in the report and should be appropriately commented. Students should be aware that considerable out of class lab time may be required to complete the lab project. All lab reports are due to the instructor one week after the lab is assigned. Reports may be submitted as a group when applicable.

Course Number and Name	AE 411. Bioprocessing and Bioproducts
Credits and Contact Hours	(3-0) Cr. 3. F.
Instructor/Course Coordinator	Tae Hyun Kim Hans Van Leuween
Textbook and supplemental materials	Recommended Text: Robert C. Brown, BIORENEWABLE RESOURCES, Blackwell Publishing/Wiley,
Catalog Description	Sustainability, cleaner production. Taxonomy, kinetics, metabolism, aerobic and anaerobic fermentation. Biofuels, bioenergy and coproducts. Mass/energy balances, process integration, pretreatment, separation. Membrane reactors, bioelectrolysis, microbial fuel cells, nanotechnology, genetic engineering, mutagenesis.
Pre-requisites	AE 216 or equivalent, Math 160 or 165; one of Chem 167 or higher, Biol 101 or higher, or BRT 501; completion of at least 3y of full-time equivalent studies
Required/Elective/Selected	Elective
Specific Outcomes	To develop an understanding of industrial microbiology principles as applied to important emerging biorenewable processes. The course helps to develop concept design approaches through a series of classes and homework exercises and extensive case studies.
Topics	See below

Week	Dates	Topics	Reading	Homework

Week 1: Introduction. Anaerobic and aerobic processing; methane production [Kim]
Week 2: Biofuels and bioenergy: ethanol, butanol, biodiesel [Kim]
Week 3: Dangerous pathogens. Oxygen demand and oxygen depletion in streams. The need for and technology of wastewater treatment. Microbial taxonomy. [Van Leeuwen]
Week 4: Sustainability, life-cycle assessment, cleaner production; microbial cultivation, special purpose organisms – bacterial, fungal and algal processes; microbial metabolism; genetic engineering principles; energy production calculations [Van Leeuwen]
Week 5: Golden section in biology and applications; Mass and energy balances; Antibiotics and vaccines [Van Leeuwen]
Week 6: Pretreatment of lignocellulosic biomass before biological conversion; Visit to BioCentury Research Farm Facility (9/29) [Kim]
Week 7: Biorefinery: sugar/protein/lignin based bioproducts; integration of value-added co-products and cellulosic ethanol in a biorefinery; Visit to CCUR grain processing and fermentation Facility (10/3) [Kim]
Week 8: Dissolved oxygen depletion in rivers and wastewater treatment [Van Leeuwen]
Week 9: Separation of products: settling, centrifugation, drying, flotation and filtration; distillation, extraction, solvent extraction, countercurrent wash processes; adsorption [Van Leeuwen]
Week 10: Ethanol plant and wastewater treatment field trip [Van Leeuwen]
Week 11: Biobased industry-economy and commercialization; Microbial fuel cells; Other emerging technologies [Kim]
Week 12: Food-grade fermentation: yoghurt, cheese, alcoholic beverages, microbial food products, and other biobased consumer products [Kim]
Week 13: Microbial remediation of wastes and recovery of energy and resources; Corn to ethanol: wet and dry-grind processes; co-product beneficiation Recovery or conversion of organic materials in wastewater into useful byproducts. [Van Leeuwen]
Week 14: Lignocellulosic ethanol production: enzymatic processes, saccharification, fermentation and in-situ enzyme processes; process integration: corn dry-grind and wet milling processes; process selection: cost and environmental factors; market forces [Van Leeuwen]
Week 14/15: EXAM 2 and Graduate student presentations of term papers [Kim and Van Leuween]

Course Number and Name	AE 413. Fluid Power Engineering
Credits and Contact Hours	(2-2) Cr. 3. F.S.SS
Instructor/Course Coordinator	Brian Steward
Textbook and supplemental materials	• Norvelle, F. D. 1995. Fluid Power Technology. West Publishing Company. • Lighting Reference Handbook, 8th Edition, Berendsen Fluid Power. • W. Durfee and Z. Sun. 2009. Fluid Power System Dynamics. Center for Compact and Efficient. Fluid Power. Available on WebCT. • Steward, B. L. 2010. The Application of Fluid Power, course notes. Available at Alpha Copies. • Steward, B. L. 2010. The Application of Fluid Power, lab manual. Available on WebCT
Catalog Description	Properties of hydraulic fluids. Performance parameters of fixed and variable displacement pumps and motors. Hydraulic circuits and systems. Hydraulic transmission. Characteristics of control valves. Analysis and design of hydraulic systems for power and control functions. Non-major graduate credit.
Pre-requisites	Credit or enrollment in E M 378 or ME 335, A E 216 or ME 270.
Required/Elective/Selected	Required for PME option
Specific Outcomes	To help students understand the concepts and application and design of fluid power systems. To help students improve skills in carrying out experiments and interpreting results, communication, problem solving, and team work. Because fluid power is so important to the operation and design of off-road (agricultural and construction) equipment, it is critical for engineers who are planning to design heavy equipment to at least be introduced to hydraulic power. Not many engineering programs offer entire courses on fluid power, and you will thus have an advantage by taking this class. There currently is a great need for people with fluid power training. Read a specification sheet for a hydraulic component or fluid and be able to explain the meaning of the specifications. Analyze power flows, efficiencies, and heat generation of a hydraulic system. Analyze and design different types of hydraulic circuits. Creatively design the hydraulic system for a product. Size closed and open circuit hydraulic systems. Use modeling and simulation software to analyze the dynamic performance of a hydraulic system. Communicate effectively about fluid power topics. Work effectively in a team. Build a hydraulic circuit as described by a schematic diagram. Identify internal components of a pump and hydrostatic transmission. Simulate the dynamics of a simple hydraulic circuit.
Topics	See below

Week	Dates	Topics	Reading	Homework
1	8/22 8/24	Introduction to Fluid Power Pressure, Work, Power	N**. Chapter 1 N: Chapter 2	
2	8/29 8/31	Hydraulic Circuit Analysis FP Systems Dynamics	A*. Chapter 1	 Learning Styles Assignment due
3	9/5 9/7	Labor Day Holiday FP System Modeling	A:Chapter2	Problem Set 1 Due
4	9/12 9/14	Continuity, Energy Balance Fluid Properties	 N:Chapter 3	 Problem Set 2 Due
5	9/19 9/21	Guest Speaker: Jim Ryken Fluid Conduits	A:Chapter 3 N:Chapter12 A:Chapter 4	
6	9/26 9/28	Pumps Motors	N: Chapter 4 A:Chapter 5	Problem Set 3 Due
7	10/3 10/5	Motors Review	N:Chapter 5	Problem Set 4 Due Mid-term Course Evaluation
8	10/10 10/12	Exam 1 Pump and Motor Efficiency		 Team Proposal Due
9	10/17 10/19	Efficiency Hydrostatic Transmissions	A:Chapter 5 A:Chapter 6	 Problem Set 5 Due
10	10/24 10/26	HST Sizing Hydraulic Cylinders		 Problem Set 6 Due
11	10/31 11/2	Directional Control Valves Review		 Problem Set 7 Due
12	11/7 11/9	Exam 2 Pressure Control Valves	 N:Chapter 8 A:Chapter 8	
13	11/14 11/16	Flow Control Valves Electrohydraulic Valves	N:Chapter 9 N:Chapter 10	 Problem Set 8 Due
----------	----------	Thanksgiving Break	----------	----------
14	11/28 11/30	Proportional Valves Hydraulic Systems	 A:Chapter 9	 Problem Set 9 Due
15	12/5 12/7	Hydraulic Systems Problems Review for Final		
16	Finals Week			

*A: Applications of Fluid Power Course Notes; ** N: Norvelle. Fluid Power Technology
*Maps to ABET Program outcomes a, e, n **Maps to ABET Program outcomes a, b, c, d, e, g, k, n

Course Number and Name	AE 415. Agricultural Engineering Design I.
Credits and Contact Hours	(1-2) Cr. 2. F.S.
Instructor/Course Coordinator	Jay Harmon
Textbook and supplemental materials	None
Catalog Description	Identification of current design problems in agricultural engineering. Development of alternate solutions using creativity and engineering analysis and synthesis techniques. Non-major graduate credit.
Pre-requisites	271 or 272, EM 324.
Required/Elective/Selected	Required
Specific Outcomes	The goal of this course is to enable you to develop the workplace competencies required to execute real-world ABE design projects. You will learn to use the knowledge gained through the ISU-ABE curriculum to identify an agricultural engineering problem, use the design process to propose a solution to the selected problem, and communicate your ideas through oral and written technical presentations. Ability to apply knowledge of mathematics, science, and engineering Ability to design and conduct experiments, as well as to analyze and interpret data Ability to design a system, component, or process to meet desired needs Ability to function on multi-disciplinary teams Ability to identify, formulate, and solve engineering problems Understanding of professional and ethical responsibility Ability to communicate effectively The broad education necessary to understand the impact of engineering solutions in a global/societal context Recognition of the need for and an ability to engage in life-long learning Knowledge of contemporary issues Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Topics	See below

Week	**Dates**	**Topics**	**Reading**	**Homework**
1	8/22	Course Logistics, Introductions, Grouping		
2	8/29	Engineering Design Process – Reading/Discussion EDP Powerpoint	Handout	
3	9/5	Labor Day Holiday – no class		
4	9/12	Old AE 415 Reports, Project Expectations, Design Strategies Powerpoint		
5	9/19	Problem Definition Powerpoint Progress Report Powerpoint		Team IDs PR 1
6	9/26	Peer Review of Design Brief & Problem Definition		
7	10/3	Objectives, Functions, and Constraints		PR 2
8	10/10	Alternatives: Quality Function Development	Case Study	
9	10/17	GANTT Charts Self Study	Power Point	PR 3
10	10/24	Ethics Case Studies		
11	10/31	Ethics Case Studies		PR 4
12	11/7	Proposal Writing		
13	11/14	Engineering Economics		PR 5
	11/21	Thanksgiving Break		
14	11/28	Professionalism – registration		PR 6
15	12/5			
16	12/14	Final Reports Due		
17	12/20	Final Oral Presentations		

Course Number and Name	AE 416. Agricultural Engineering Design II.
Credits and Contact Hours	(1-2) Cr. 2. F.S.
Instructor/Course Coordinator	Jay Harmon
Textbook and supplemental materials	None
Catalog Description	Selection of promising solutions to design problems identified in 415 for development by design teams. Presentation of designs through oral and written reports and prototypes. Non-major graduate credit.
Pre-requisites	AE 415
Required/Elective/Selected	Required
Specific Outcomes	Students will develop workplace competencies in a true-to-life engineering design situation. Students will integrate knowledge gained in other Ag Engr courses, identify design problems, create a team design project, and present an oral and report of the project. Ability to apply knowledge of mathematics, science, and engineering Ability to design and conduct experiments, as well as to analyze and interpret data Ability to design a system, component, or process to meet desired needs Ability to function on multi-disciplinary teams Ability to identify, formulate, and solve engineering problems Understanding of professional and ethical responsibility Ability to communicate effectively The broad education necessary to understand the impact of engineering solutions in a global/societal context Recognition of the need for and an ability to engage in life-long learning A knowledge of contemporary issues Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Topics	See below

Week	Dates	Topics	Reading	Homework
1	8/22	Classes begin – groups should reorganize for the semester. Groups Meet w/ Instructor		
2	8/29			Progress Report #1 Due
3	9/5			
4	9/12	Groups Meet w/Instructor		Progress Report #2 Due
5	9/19			
6	9/26			Progress Report #3 Due
7	10/3			
8	10/10	Groups Meet w/ Instructor		Progress Report #4 Due
9	10/17			
10	10/24			Progress Report #5 Due
11	10/31			
12	11/7			
13	11/14	Groups Meet w/ Instructor		Progress Report #6 Due
	11/21			
14	11/28	Final Oral Presentations (Tentative)		Progress Report #7 Due
15	12/5			
16	12/14	Finals Week- All Materials Due by 5 pm		

Team Performance Policies

Equality of work - Work is to be conducted by the team with an equal distribution of tasks. It is up to the team to assign tasks and to police this policy.

Meetings – It is expected that each team will meet outside of class once per week or more frequently when required. Minutes of these meetings should be recorded in each student's logbook.

Conflicts- Students are to make every attempt to work out conflicts within their group. The instructor should be informed and asked to intervene only when diligent attempts of resolution have failed.

Dismissing a team member – Occasionally a team member will refuse to participate at a satisfactory level, even after much urging by his/her teammates. Teams which are dissatisfied with the productivity of a team member may vote to dismiss that team member. That team member will then have to complete an independent project of sufficient scope to warrant full credit in the course. Full documentation of shortcomings and attempts to reconcile will be expected by the instructor before the decision is deemed final. The instructor has the final decision.

Group Mentor – Teams should have an appropriate mentor which can be provide some oversight of projects. They are not to make decisions for a team, but only provide guidance. Mentors can be faculty or an appropriate industry person.

Course Number and Name	AE 424. Air Pollution
Credits and Contact Hours	(1-0) Cr. 1.
Instructor/Course Coordinator	Jacek Koziel
Textbook and supplemental materials	Wark, K, Warner, CF and Davis, WT (1998) Air Pollution – its origin and control. Addison-Wesley ISBN 0-673-99416-3
Catalog Description	1 cr. per module. Module A prereq for all modules; module B prereq for D and E.
Pre-requisites	Either Phys 221 or Chem 178 and either Math 166 or 3 credits in statistics. Senior classification or above
Required/Elective/Selected	Elective
Specific Outcomes	Ability to apply knowledge of mathematics, science, and engineering Ability to design and conduct experiments, as well as to analyze and interpret data Ability to identify, formulate, and solve engineering problems Understanding of professional and ethical responsibility Ability to communicate effectively The broad education necessary to understand the impact of engineering solutions in a global/societal context Recognition of the need for and an ability to engage in life-long learning A knowledge of contemporary issues Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Topics	See below

Week of	Day 1	Day 2	Text (Day1/Day2)	Instructor (Day1/Day2)
Module A				
Jan 9	Introduction	Effects & Sources of Air Pollutants	Notes; Ch1&2, Wark et al.	Hallmark
Jan 16	Federal Legislation	Global Warming	Notes; Ch 3 Wark Ch 8, Masters	Hallmark van Leeuwen
Jan 23	Global Warming	Particulates	Chapter 5, Wark	van Leeuwen
Jan 30	Meteorology	Dispersion	Chapter 4, Wark	Hallmark
Feb 6	Dispersion	Volatile organic compounds	BBL Notes	Koziel
Module B				
Feb 13	Flue gas treatment	Exam 1 – Module A	Chapter 6, 7 & 8, Wark et al.	van Leeuwen
Feb 20	Odor	Photochemical Reactions	Notes; Ch 8, Masters & Ela	Koziel van Leeuwen
Feb 27	Noise Pollution	Air sampling and analysis	Notes & Ch 15, Davis & Masten	van Leeuwen Koziel
Mar 5	Air sampling and analysis	Indoor air quality	BBL Notes	Koziel
Mar 12	Spring Break			
Mar 19	Indoor air quality	Exam 2 – Module B	BBL Notes	Koziel
Module C, D, E				
Mar 26 - April	C Mobile Sources	Mainly self study	Notes	Hallmark
Mar 26 - April	D Industrial Air Pollution Control	Mainly self study Design of equipment	Wark et al., Ch 5, 6, 7 & 8	van Leeuwen
Mar 26 - April	E Aerial Emissions from Agriculture	Understanding air quality issues and agriculture. Measurements, regulations, mitigation.	BBL Notes	Koziel
April 16	Student Presentations			Koziel van Leeuwen Hallmark
April 23	Student presentations			
April 30	Exam – for Modules C, D and E if required as arranged			

Course Number and Name	AE 431. Design and Evaluation of Soil and Water Conservation Systems.
Credits and Contact Hours	(2-3) Cr. 3. F.
Instructor/Course Coordinator	Amy Kaleita
Textbook and supplemental materials	Soil and Water Conservation Engineering, 5th Edition, by Fangmeier et al. ISBN 1-4018-9749-5
Catalog Description	Hydrology and hydraulics in agricultural and urbanizing watersheds. Design and evaluation of systems for the conservation and quality preservation of soil and water resources. Use and analysis of hydrologic data in engineering design; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality preservation of soil and water for agriculture. Small watershed hydrology, water movement and utilization in the soil-plant-atmosphere system, agricultural water management, best management practices, and agricultural water quality.
Pre-requisites	E M 378 or Ch E 356
Required/Elective/Selected	Required for AES option
Specific Outcomes	Understand, analyze, and interpret hydrologic data for land and water resources engineering and environmental protection. Competencies highlighted: engineering knowledge, general knowledge. Assessment will be primarily through exams and quixercises. Interpret and synthesize processes leading to natural resources degradation, formulate solutions, and design systems for land and water resource protection. Competencies highlighted: planning, innovation, customer focus, cultural adaptability. Assessment will be primarily through lab exercises. Evaluate alternative scenarios and conduct engineering analysis to justify use of conservation solutions to protect valuable natural resources. Competencies highlighted: analysis and judgment, continuous learning. Assessment will be primarily through quixercises and labs.
Topics	See below

Week	Dates	Topics	Reading	Homework
1	August:22,23,24	Lecture 1: Introduction, Hydrologic Cycle Lecture 2: Lab 1 – Topographic Data Analysis Lecture 3: Precipitation Measurement & Mapping	Ch 1, Ch 3.1-3.4 Ch 3.5-3.10	
2	August:29,30,31	Lecture 4: Hydrologic data and frequency analysis Lecture 5: Lab 2 – Hydrologic Frequency Analysis Lecture 6: Infiltration	Ch 3.11-3.15 Ch 5.1-5.10	
3	September:6,7	Lecture 7: Lab 3- Modeling Infiltration Lecture 8: Runoff	Ch 5.11-5.19	
4	September: 12,13,14	Lecture 9: Runoff Estimation Lecture 10: Lab 4- Runoff Estimation Lecture 11: Open Channel Flow	Ch 6.8-6.12	
5	September: 19,20,21	Lecture 12: Vegetated Waterways Lecture 13: Lab 5- Waterway Design Lecture 14: Soil Erosion	Ch 8.18-8.31 Ch 7.1-7.8	
6	September: 26,27,28	Lecture 15: Estimating Soil Erosion Lecture 16: Lab 6- USLE Lecture 17: Conservation Practices	Ch 7.9-7.10 Ch 7.11-7.16	
7	October: 3,4,5	Lecture 18: Terraces Exam 1 Lecture 20: Virtual Field Trip	Ch 8.1-8.17	
8	October: 10,11,12	Lecture 23: Ponds and Embankments Lecture 22: Lab 7 – Conservation Practices Lecture 21: NRCS Programs (guest lecture)	Ch 9.12-9.26	
9	October: 17,18,19	Lecture 24: Dam Design Lecture 25: Lab 8 – Dam Design Lecture 26: Hydrology models		
10	October: 24,25,26	Lecture 27: Water Quality Lecture 28: Lab 9 – Hydrology Models Lecture 29: Water Quality		
11	October: 31 November: 1,2	Lecture 30: Pollutant Transport Exam 2 Lecture 32: Wetlands	Ch 12	
12	November: 7,8,9	Lecture 33: Constructed Wetlands Lecture 34: Lab 10 – Wetland Design Lecture 35: Drainage	Ch 14	
13	November: 14,15,16	Lecture 36: Drainage Design Lecture 37: Lab 11 – Drainage Design Lecture 38: Emerging Issues in Drainage		
14	November: 28,29,30	Lecture 39: Evaportranspiration Lecture 40:Lab 12- ET Estimation Lecture 41: Irrigation	Ch 4, Ch 15.1-15.3	
15	December: 5,6,7	Lecture 42: Irrigation Lecture 43: Irrigation Design Lecture 44: Course Recap	Ch 17	
16	December:16	Final Exam		

Course Number and Name	AE 436. Design and Evaluation of Soil and Water Monitoring Systems
Credits and Contact Hours	(2-3) Cr. 3. Alt. S
Instructor/Course Coordinator	Amy Kaleita
Textbook and supplemental materials	No textbook required for this course. Readings will include materials from authoritative sources on the internet, in scientific journals, etc.
Catalog Description	Development of monitoring systems that support effective planning, performance evaluation, modeling, or environmental impact assessment of soil-, water-, and waste-management systems. Typical soil and water pollutants and physical, chemical, and biological characteristics that affect sample location and timing. Sample collection, documentation, chain-of-custody, and quality assurance procedures.
Pre-requisites	A E 431 or permission of the instructor
Required/Elective/Selected	Elective
Specific Outcomes	Understand the various needs in monitoring soil and water systems, and identify stakeholders and objectives. This includes: List major soil and water pollutants, and their impacts on resource use, and cite concentrations believed to be harmful. Describe transport mechanisms & factors affecting pollutant movement and the design of pollutant monitoring systems. Design a monitoring system to meet its objectives and give high quality and statistically meaningful results. This includes: Select appropriate soil and water monitoring techniques to achieve the objectives Understand advantages and shortcomings of different approaches List quality assurance and quality control procedures appropriate for soil and water monitoring systems. Fluently discuss issues and the science related to design of soil of water monitoring plans; any project stakeholders will expect you to be able to communicate about the work. This means: Your participation in class discussions is expected and mandatory. b. You will be preparing oral and written project reports.
Topics	See below

Week	Dates	Topics	Reading	Homework
Part I **Technical and Conceptual Foundation** In this part, we will review (for some of you) or introduce (for others of you) the fundamental scientific and technical principles that underpin appropriate and robust design of monitoring plans. Perspectives on water quality monitoring and assessment Why monitor? Issues, fundamental monitoring questions, regulatory programs Overview of monitoring - basic objectives, planning components, types of data, water quality vs watershed monitoring Steps in designing, developing, implementing, and evaluating a monitoring project Hydrology Review Precipitation, infiltration, runoff Soil erosion Pollutants, sources, impacts Nitrogen Phosphorus Sediment Bacteria Pesticides Pollutant transport, attenuation, loading Groundwater Streamflow Attenuation mechanisms - adsorption, biodegradation, volatilization, dilution				
Part II **Functional Elements in Design of Monitoring Systems** In this part we will cover more mechanical aspects of monitoring plans, with a focus on xyz Data collection – what? Linking monitoring with project objectives Ancillary and indirect measures: pH, DO, benthos Data collection – how? Sampling techniques: streams and lakes Sampling techniques: watershed Data generation Statistical considerations in planning collection of data Introduction: relationship of statistical analysis to project objectives Basic frameworks: Paired watersheds, upstream/downstream approaches Understanding the limits of observed data (sampling frequency, minimum detectable change, what is zero, etc.) Basic statistics for water resource data Autocorrelation & Covariation Change detection Trend detection				
Part III. **Data Quality** In this part, we will discuss the critical externalities of collecting, handling, preserving, storing, and re-porting data. Any project where data collection is involved and where others will see or use the data at any time requires the data be of known and documented quality. Sample handling Sample preservation QA/QC Chain-of-custody Data handling Metadata Documentation Agency differences and reporting standards Communicating data to stakeholders				

Course Number and Name	AE 451. Food and Bioprocess Engineering
Credits and Contact Hours	(3-0) Cr. 3. F.
Instructor/Course Coordinator	Chenxu Yu
Textbook and supplemental materials	Introduction to Food Engineering, 3rd edition, Singh, R.P. and Heldman, D.R. Math Concepts for Food engineering, 2nd edition, Hartel, R. W. Howell, T. A., and Hyslop, D. B. Rheological Methods in Food Process Engineering, 2nd edition, Steffe, J. F. Unit Operations in Food Processing, Earle, R. L. and Earle, M. D. Introduction to Food Process Engineering. Smith, P. G. Food Processing Modeling and Control, Özilgen, M.
Catalog Description	Application of engineering principles and mathematical modeling to the quantitative analysis of food and bioprocessing systems. Physical/chemical characteristics of foods and biological systems, flow processes, thermal processes and separation processes.
Pre-requisites	A E 216 and M E 436 or CH E 357, or FS HN 351 and MATH 266 or MATH 267
Required/Elective/Selected	Elective
Specific Outcomes	Understand and obtain critical physical/chemical properties of biomaterials and their implications in process design; Utilize Matlab to solve an array of computational problems found in food and bioprocess engineering; Be able to quantitatively analyze selected operations in food and bioprocessing engineering; Understand and design food and bioprocess systems. Focus will be on flow processes including extrusion; thermal processes for preservation, and separation processes for downstream product extraction including ultrafiltration. Understand how to use enzymatic biotransformation to make variety of chemical products out of biomass and biomaterials, in replacement of petrochemistry. Critically evaluate current literatures concerning food and bioprocess engineering topics
Topics	See below

Week	Dates	Topics	Reading	Homework
	Two weeks	Physics of Food and Bioprocesses		
		Mass Balance Thermodynamics Energy Balance		
	Two weeks	Physical Properties of Food and Biomaterials		
		Thermal Properties Food Rheology		
		First Mid-term		
	Three weeks	Flow Processes		
		Continuity Equation and Velocity Profiles Berboulli Equation and Energy Equation, Isothermal Flow Pumping, Flow Meters Food Extrusion		
	Three weeks	Heat Transfer and Thermal Processes		
		Heat Transfer in Foods- Important Problems. Heat exchanging system in food and bioprocesses Thermal Processing-Conventional Aseptic Processing-UV, electromagnetic, high pressure, etc. Food Freezing		
		Second Mid-term		
	One week	Drying/Dehydration		
	One week	Separation and Extraction		
		Review and Final Exam		

Course Number and Name	AE. 469 Grain Processing and Handling
Credits and Contact Hours	(2-3) Cr. 3. S.
Instructor/Course Coordinator	Carl Bern
Textbook and supplemental materials	Bern, C. J., C. R. Hurburgh, T. J. Brumm 1/12 edition Managing grain after harvest. Course Works. ISU Bookstore. Bern, C. J. AE 469/569 Lab Manual. Spring 2012 Edition, Course Works, ISU Bookstore
Catalog Description	Cereal grain and oilseed properties, quality measurement, processing, and end-use value. Design of drying systems using computer simulation. Corn wet and dry milling. Soybean oil extraction. Grain handling systems.
Pre-requisites	AE 216
Required/Elective/Selected	Elective
Specific Outcomes	Design a fan-grain-bin system for a specific application Design a natural-air or heated-air grain dryer Plan, carry out and report on an experiment related to grain or oilseed preservation Critically evaluate a grain storage system Critically evaluate operation of a grain dryer, a size-reduction machine, a corn wet-milling process, a corn dry-grind ethanol process, and a soybean oil extraction process Critically evaluate technical publications on grain or oilseed preservation, processing or handling
Topics	See below

Week	Dates	Topics	Reading	Lab
1	1/9 1/11	Introduction, Preservation Moisture		Term project discussion
2	1/16 1/18	NO CLASS MLK day Bushel, test weight		Quantifying corn damage
3	1/23 1/25	Equilibrium moisture, load value Psychrometric analysis		Corn deterioration
4	1/30 2/1	Psychrometric analysis Deterioration		Fan-grain systems
5	2/6 2/8	Mycotoxins Fan-Grain systems		Fan-grain lab
6	2/13 2/15	Drying methods Drying methods		Drying methods
7	2/20 2/22	Soybean processing Soybean processing		Soy processing tour
8	2/27 2/29	HOUR EXAM NIR 1559 FS		NIR 1559 FS
9	3/5 3/7	NIR 1559 FS Grain handling		Term project discussion
10		SPRING BREAK		No Lab
11	3/19 3/21	Grain handling Corn processing		To be announced
12	3/26 3/28	Corn processing Corn processing		Corn Processing
13	4/2 4/4	Grain handling Grain handling		Tour
14	4/9 4/11	Grain handling Grain handling		Grain handling
15	4/16 4/18	Grain handling High-moisture preservation		Film Festival
16	4/23 4/25	High-moisture preservation HOUR EXAM		Tour

Course Number and Name	AE 472. Design of Environmental Modification Systems for Animal Housing
Credits and Contact Hours	(3-0) Cr. 3. Alt. S.
Instructor/Course Coordinator	Steve Hoff
Textbook and supplemental materials	Environment Control for Animals and Plants, L.D. Albright, ASAE Publishers
Catalog Description	Principles and design of animal environmental control systems. Insulation, heat and mass transfer, fans, ventilation, air distribution, heating and cooling equipment, energy use, control strategies.
Pre-requisites	AE 216, M E 330
Required/Elective/Selected	Required for AES option
Specific Outcomes	Analyze multi-step psychrometric processes common to livestock housing systems Perform an energy audit for livestock housing Develop a system characteristics graph for any ventilation arrangement used in livestock housing Analyze and predict air distribution patterns for isothermal and non-isothermal airflow Develop software in Excel and Visual Basic to perform ventilation analysis Relationship to Program Objectives (Criterion 2): This course contributes toward attainment of Program Objectives 1, 2, and 5 as follows: 1. Fundamental laws associated with heat transfer and fluid flow used throughout course. 2. Design project required allowing students to work in teams to solve an environmental control problem in animal housing. 5. Experiments conducted on ventilation performance, air distribution, and energy efficiency to gain hands-on experience in livestock ventilation systems. Contribution to Professional Component (Criterion 4): A significant portion of this course is devoted to a continuous development of a design software program that students develop throughout the course for the design of animal housing ventilation systems. This program, when completed, will allow students to evaluate and design all aspects of an animal housing design situation.
Topics	See below

Week	**Dates**	**Topics**	**Reading**	**Homework**
1		Psychrometric Properties		
2		Psychrometric Processes		
3		Heat transfer fundamentals		
4		Building energy Analysis		
5		Inlet systems and analysis		
6		Fan systems and analysis		
7		Air distribution assessment and analysis		
8		Ventilation system characteristic Technique		
9		Air Quality Control		
10		Instrumentation for assessing the environment		

Course Number and Name	AE 478. Wood Frame Structural Design
Credits and Contact Hours	(3-0) Cr. 3. Alt. S.
Instructor/Course Coordinator	Jay Harmon Steven J. Hoff
Textbook and supplemental materials	Wood Design Package. 2005. American Wood Council. www.awc.org
Catalog Description	Design of light-framed wood structures using LRFD and ASD design procedures. Includes analysis of wind, snow, dead, and live loads. Applications include animal housing and machine storage. Fasteners, laminated posts, truss design and use of National Design Specifications.
Pre-requisites	AE 216, EM 324.
Required/Elective/Selected	Elective
Specific Outcomes	Gain a basic knowledge and appreciation of the fundamental principles of light frame structural design Increase your ability to apply current knowledge and adapt to emerging applications Improve your ability to identify, analyze, and solve technical problems
Topics	See below

Week	Dates	Topics	Reading	Homework
1	January: 10,12,14	Class introduction/expectations Loads : Dead & Live Loads : Snow		
2	January: 17,19,21	Martin Luther King Day – No Class Loads: Snow Loads: Wind		
3	January: 24,26,28	Loads: Wind Loads: Wind Review of Moment/Shear Diagrams & Deflection		
4	January: 31 February: 2,4	Review of Moment/Shear Diagrams & Deflection Wood Properties & Lumber Grades ASD & LRFD Basics		
5	February: 7,9,11	Beam Design – bending Test 1 Beam Design – Lateral Stability/Shear		
6	February: 14,16,18	Beam Design – Deflection/ Bearing/Summary Beam Design – Sawn Lumber Examples Beam Design – Glulam Analysis Examples		
7	February: 21,23,25	Column Design Column Design – Stability Tension Members		
8	February: 28 March: 2, 4	Combined Bending & Axial Loading Engineered wood products Engineered wood products		
9	March: 7,9,11	Test 2 Mechanical Connections Dowel type fasteners nails/bolts/lag screws		
	March: 14-18	SPRING BREAK		
10	March: 21,23,25	Dowel type fasteners nails/bolts/lag screws Dowel type fasteners nails/bolts/lag screws Trusses – design of components		
11	March: 28,30 April: 1	Trusses – selection/handling Post Embedment Design Post Embedment Design		
12	April: 4,6,8	Post Embedment Design Test 3 Behavior of structures under loading		
13	April: 11,13,15	Behavior of structures under loading Complete building design examples		
14	April: 18,20,22	Complete building design examples		
15	April: 25,27,29	Review & catch up		
16	Finals Week			

Course Number and Name	CHEM 167. General Chemistry for Engineering Students.
Credits and Contact Hours	(4-0) Cr. 4. F.S.
Instructor/Course Coordinator	R. S. Houk
Textbook and supplemental materials	*Chemistry for Engineering Students* - by Brown and Holme (2nd Edition), Cengage, 2006 (ISBN:13:978-1-4390-4791-0).
Catalog Description	Principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer. Only one of Chem 163, 167, 177, or 201 may count toward graduation.
Pre-requisites	*MATH 140 or high school equivalent and 1 year of high school chemistry or CHEM 50*
Required/Elective/Selected	Required
Specific Outcomes	
Topics	See Below

APPROXIMATE) Week	**Chapter & Topics**	**Exams**
Jan 10-14	1&2 Intro, Atoms & Molecules	
Jan 17-21	3 Molecules, Moles and Chemical Equations	
Jan 24-28	4 Stoichiometry	
Jan 31-Feb 4	4 Stoichiometry	
Feb 7-11	4 Stoichiometry & 5 Gases	Exam #1: Feb. 9
Feb 14-18	5 Gases	
Feb 21-25	6 Periodic Table and Atomic Structure	
Feb 28-Mar 4	7 Chemical Bonding & Structure	
Mar 7-11	8 Molecules and Materials	**Exam #2: Mar. 9**
Mar 14-18	Break	
Mar 21-25	9 Energy and Chemistry	
Mar 28-Apr 1	10 Entropy & Thermodynamics	
Apr 4-8	11 Kinetics	
Apr 11-15	11 Kinetics & 12 Equilibrium	**Exam #3: Apr 13**
Apr 18-22	12 Chemical Equilibrium	
Apr 25-29	13 Electrochemistry	
May 5 Thurs	Comprehensive Final Exam: 9:45-11:45 AM	

Course Number and Name	**CHEM 167L. Laboratory in General Chemistry for Engineering**
Credits and Contact Hours	(0-3) Cr. 1. F.S.
Instructor/Course Coordinator	R. S. Houk
Textbook and supplemental materials	Chemistry Lab Manual for 167L, 177L, 178L, University Book Store Course Pack
Catalog Description	Laboratory to accompany 167. Only one of Chem 163L, 167L, and 177L may count toward graduation.
Pre-requisites	***Credit or enrollment for credit in CHEM 167***
Required/Elective/Selected	Required
Specific Outcomes	
Topics	See chart below.

Week	Topic
1	Lab Check-In; Start Observing Chemical Reactions; Safety Orientation
2	Complete Observing Chemical Reactions
3	Measurements
4	Polymers
5	The Empirical Formula of an Oxide of Copper; Practical Task 1; Safety Assignment #1 Due
6	Gas Phase Chemical Reactions; Safety Assignment #2 Due
7	Atomic Spectroscopy; Safety Assignment #3 Due
8	The Phase Diagram for the Bismuth-Tin System; Safety Assignment #4 Due
9	Optical Diffraction Experiments; Practical Task 2; Safety Assignment #5 Due
10	The Heat of Formation of Magnesium Oxide; Safety Assignment #6 Due
11	Oxidation-Reduction Reactions; Practical Task 3; Safety Assignment #7 Due
12	Kinetics; Safety Assignment #8 Due
13	Equilibrium
14	Electrochemistry: Galvanic Cell; Practical Task 4
15	Lab check-out; Attendance is required.

Course Number and Name	**CHEM 177. General Chemistry I**
Credit/offering	(4-0) Cr. 4. F.S.SS.
Instructor/Course Coordinator	Dr. Irmi Schewe-Miller
Textbook and supplemental materials	"Chemistry: The Central Science," 11th Ed., Brown, LeMay, Bursten, and Murphy, Prentice Hall, 2006. Mastering Chemistry Student Access Kit (web-based homework system), Prentice Hall; Turning Point RF Clicker (RFC-03). A Study Guide, a Student Solutions Manual, and The Cartoon Guide to Chemistry are available at the bookstores. These are not required, but students may find them useful.
Catalog Description	The first semester of a two semester sequence which explores chemistry at a greater depth and with more emphasis on concepts, problems, and calculations than 163-164. Recommended for physical and biological science majors, chemical engineering majors, and all others intending to take 300-level chemistry courses. Principles and quantitative relationships, stoichiometry, chemical equilibrium, acid-base chemistry, thermochemistry, rates and mechanism of reactions, changes of state, solution behavior, atomic structure, periodic relationships, chemical bonding. Credit by examination (test-out exams) for 177 is available only to students who are not currently enrolled in the course.
Pre-requisites	MATH 140 ***or high school equivalent, and CHEM 50 or 1 year high school chemistry, and credit or enrollment in*** CHEM 177L***. Chemistry and biochemistry majors may consider taking*** CHEM 201
Required/Elective/Selected	Required
Specific Outcomes	
Topics	See chart below

Week	Topic
1	Introduction,Chapter 1: Matter and Measurement
2	Chapter 1: continued; Chapter 2: Atoms, Molecules, and Ions
3	Chapter 2: continued; Chapter 3: Stoichiometry
4	Chapter 3: continued; Exam I (Chapters 1, 2 and part of 3)
5	Chapter 3: continued; Chapter 4: Solution Stoichiometry
6	Chapter 4: continued; Chapter 5: Thermochemistry
7	Chapter 5: continued
8	Chapter 5: continued; Chapter 6: Electronic Structure; Exam II (Chapters 3, 4 and 5
9	Chapter 6: continued; Chapter 7: Periodic Properties of the Elements
10	Chapter 7: continued
11	Chapter 8: Chemical Bonding
12	Chapter 9: Molecular Geometry; Exam III (Chapters 6, 7 and 8)
13	Chapter 9: continued; Chapter 10: Gases
14	Chapter 11: Intermolecular Forces
15	Chapter 13: Solutions; Odds and ends

Course Number and Name	CHEM 177L. Laboratory in General Chemistry I
Credits and Contact Hours	(0-3) Cr. 1. F.S.
Instructor/Course Coordinator	Dr. Irmi Schewe-Miller
Textbook and supplemental materials	"Chemistry: The Central Science," 11th Ed., Brown, LeMay, Bursten, and Murphy, Prentice Hall, 2006. Mastering Chemistry Student Access Kit (web-based homework system), Prentice Hall; Turning Point RF Clicker (RFC-03). A Study Guide, a Student Solutions Manual, and The Cartoon Guide to Chemistry are available at the bookstores. These are not required, but students may find them useful.
Catalog Description	Laboratory to accompany 177. 177L must be taken with 177. 177N: For chemistry and biochemistry majors. Only one of Chem 163L, 167L, and 177L may count toward graduation
Pre-requisites	Credit or enrollment for credit in CHEM 177
Required/Elective/Selected	Required
Specific Outcomes	
Topics	See chart below.

Week	Topic
1	Exp. 1 Measurements; Safety Rules
2	Lab Check-In; Finish Measurements; Safety: Personal Protection and Laboratory Protocol;
3	Exp. 2 Observing Chemical Reactions
4	Exp. 3 The Empirical Formula of an Oxide of Copper. Safety Reading 1: Toxicology – Routes of Entry, Dose
5	Exp. 4 The Conversion of Aluminum to Aluminum Potassium Sulfate – report due the week 12. (; Safety Reading 2: Toxicology – Exposure Limits; Start Safety Reading 3 [due following week]
6	Exp. 5 Acids, Bases and their Reactions: Some Quantitative Experiments. Safety Reading 3: Toxicology – Hazard Warnings, NFPA Signs and Other Symbols, Chemical Labels
7	Exp. 6 The Heat of Formation of Magnesium Oxide. Safety Reading 4: Material Safety Data Sheets
8	Lab Practical Exam I
9	Exp. 7 Atomic Spectroscopy [including flame tests but not flame temperature]; Safety Reading 5: Material Safety Data Sheets
10	Exp. 8 The Preparation of Aspirin; Safety Reading 6: Material Safety Data Sheets
11	Exp. 9 Gas Phase Chemical Reactions; Safety Reading 7: Material Safety Data Sheets
12	Exp. 10 Optical Diffraction Experiments; “The Conversion of Aluminum to Aluminum Potassium Sulfate” lab report due. Safety Reading 8: Federal Organizations: OSHA, EPA
13	Lab Practical Exam II
14	Exp. 11 Chromatography of Amino Acids
15	Lab check-out; Attendance is required.

Course Number and Name	ENGL 150. Critical Thinking and Communication.
Credits and Contact Hours	(3-0) Cr. 3. F.S.SS.
Instructor/Course Coordinator	ISUComm – Barb Blakely, Foundation Courses Director
Textbook and supplemental materials	Lunsford, Andrea. *The Everyday Writer, 8th edition*. Boston: Bedford/St. Martin's, 2010. Trimbur, John. *The Call to Write, Brief Fifth edition*. Boston: Wadsworth Cengage Learning, 2011. *ISUComm Foundation Courses Student Guide for English 150 and 250,* Iowa State University, Department of English, 2010 - 2011.
Catalog Description	Application of critical reading and thinking abilities to topics of civic and cultural importance. Introduction of basic oral, visual, and electronic communication principles to support writing development. Initiation of communication portfolio.
Pre-requisites	*Credit for or concurrent enrollment in LIB 160*
Required/Elective/Selected	required
Specific Outcomes	*Written* • adapt your writing to specific purposes, audiences, and situational contexts • integrate and document a range of informational sources, from personal interviews to print and electronic publications • practice varied organizational strategies and transitional devices • match expression to situation and audience, avoiding errors that distract or confuse • design effective presentation forms by attending to spacing, margins, headings, color, and typography • develop strategies to revise your own writing • reflect upon your communication processes, strengths, goals, and growth *Oral* • interview others, asking effective questions and listening actively • function as an effective team member in small groups as contributor, listener, collaborator, and presenter • develop basic oral presentation skills, focusing on meaningful information, clear organization, and engaging delivery *Visual* • use typography effectively, particularly in creating headings and subheadings • create an appropriate layout format for a bookmark, brochure,

	fact sheet, or newsletter • analyze visual communication, such as art on campus • use visuals effectively (e.g., imported, scanned, or digital pictures) and integrate them with written texts • accurately document visual sources *Electronic* • use appropriate format, voice, and language in a professional email (e.g., correspondence with an instructor) • use word processing skills, including making headings, attachments, tables, etc. • create an electronic composition (e.g., communication eportfolio) • choose one or more suitable media for delivering a communication to its intended audience

Week	**Topic(s)**
Week 1	Introduction to course; Course policies awareness form; Semester portfolio intro; Introductory writing; Begin Asgnmt #2, Sharing Experiences: Letter-as-Essay or Memoir
Week 2	Continue work on Asgnmt #2, Sharing Experiences
Week 3	Finishing, reviewing, editing, and submitting Assignment #2, Sharing Experiences; Begin Assignment #3 (Exploring a Campus Place or Organization: Public Document and Profile)
Week 4	Continue Asgnmt #3 (Exploring a Campus Place or Organization: Public Document and Profile); Conferences; Presentations
Week 5	Individual Conferences; Continue working individually on Assignment #3 (Exploring a Campus Place or Organization)
Week 6	Peer Response for Asgnmnt #3; Continue Assignment #3 (Exploring a Campus Place or Organization); Assignment #3 DUE
Week 7	Begin Assignment #4: Analyzing Campus Place or Artifact. Report and Commentary
Week 8	Continue Assignment #4: Analyzing Campus Place or Artifact.
Week 9	Continue Assignment #4: Analyzing Campus Place or Artifact.
Week 10	Sharing Assignment #4: Analyzing Campus Place or Artifact. Paper due
Week 11	Begin Assignment #5: Designing Visual Communication: Web Page, Brochure, Poster
Week 12	Continue Assignment #5: Designing Visual Communication and work on oral presentation to accompany your visual
Week 13	Oral Presentations about Design Decisions in Visual Communication
Week 14	Begin #6: Portfolio
Week 15	Portfolios
Week 16	Final exam week.

Course Number and Name	**ENGL 250. Written, Oral, Visual, and Electronic Composition.**
Credits and Contact Hours	(3-0) Cr. 3. F.S.SS.
Instructor/Course Coordinator	ISUComm – Barb Blakely, Foundation Courses Director
Textbook and supplemental materials	Crusius, Timothy and Carolyn Channell. *The Aims of Argument: Text and Readings, 7th edition*. Boston: McGraw-Hill, 2011. *ISUComm Foundation Courses Student Guide for English 150 and 250,* Iowa State University, Department of English, 2010 - 2011. Lunsford, Andrea. *The Everyday Writer, 8th edition*. Boston: Bedford/St. Martin's, 2010.
Catalog Description	Analyzing, composing, and reflecting on written, oral, visual, and electronic (WOVE) discourse within academic, civic, and cultural contexts. Emphasis on supporting a claim and using primary and secondary sources. Continued development of student portfolio.
Pre-requisites	*ENGL 150 or exemption from ENGL 150; sophomore classification or exemption from ENGL 150; credit for or concurrent enrollment in LIB 160*
Required/Elective/Selected	required
Specific Outcomes	*Written* • analyze professional writing to assess its purpose, audience, and rhetorical strategies • construct arguments that integrate logical, ethical, and emotional appeals • write source papers analyzing a rhetorical situation and identifying and accurately documenting appropriate source material • avoid distracting or confusing sentence-level errors • reflect systematically upon all of your communication processes, strengths, goals, and growth *Oral* • give an oral presentation, either individually or as part of a team, using effective invention, organization, language, and delivery strategies • be an effective team member in small groups as a contributor, listener, and presenter

	Visual • rhetorically analyze visual communication, such as an advertisement, film, etc. • create a visual argument (i.e., advertisement, bookmark, poster, slide presentation) *Electronic* • rhetorically analyze electronic communication, such as emails or websites • create an electronic composition (e.g., communication eportfolio)

Week	Topic
1	Discussion of class policies. Sign Course Policy Awareness sheet. In-Class Literacy Autobiography
2	Summarizing an essay
3	Textual Rhetorical Analysis
4	Textual Rhetorical Analysis
5	Textual Rhetorical Analysis
6	Visual Rhetorical Analysis with Oral Presentation
7	Visual Rhetorical Analysis
8	Oral Presentation of Visual Rhetorical Analysis, Documented Essay
9	The Documented Essay of Mediation: Resolving Conflict
10	Documented Essay
11	Documented Essay
12	Individual Oral Presentations with Visual
13	Individual Oral Presentations with Visual. Individual Reflections
14	Portfolio
15	Portfolio
16	Finals Week

Course Number and Name	**ENGR 101. Engineering Orientation.**
Credits and Contact Hours	Cr. R. F.S.
Instructor/Course Coordinator	**Amy Brandau**
Textbook and supplemental materials	n/a
Catalog Description	Introduction to the College of Engineering and the engineering profession. Information concerning university and college policies, procedures, and resources. Undeclared sections: Considerations in choosing an engineering curriculum. Opportunities to interact with departments. Declared sections: Introduction to major-specific topics. Offered on a satisfactory-fail basis only.
Pre-requisites	none
Required/Elective/Selected	required
Specific Outcomes	• Familiarize you with Iowa State University and the College of Engineering • Provide you with knowledge of resources to help you succeed at Iowa State • Help you become familiar with engineering and the disciplines offered at ISU
Topics	See Below

Week	***Date***	**Schedule & Assignments**	**Assignments Due**	***Events/*** ***Handouts***
1	Aug. 24/26	Lecture: Introduction / Campus Resources / What is Engineering *Complete Department/Club Visit,* ***due Week 11***		Class Syllabus Help Resources Department/Club Visit Wkst
2	Aug. 31/ Sept. 2	Lecture: Engineering Competencies / Résumé Tips / Weekly Study Planning *Complete Weekly Study Plan,* ***due Week 3*** *Complete Résumé,* ***due Week 5***		List of Engineering Competencies Weekly Study Plan
3	Sept. 7/9	***Presentations – Dr. Jonathan Wickert, Dean and E-Week*** Lecture: Career Development – Career Fair / Co-ops and Internships / Interviewing Tips *Complete Career Fair Worksheet,* ***due Week 6*** *Academic Success Worksheet*, ***due Week 5***	*Weekly Study Plan due*	Academic Success Wkst Career Fair Wkst **Tour the World – Engineering Study & Work Abroad Fair – Sept. 7, 5:30-7:00 pm, Howe Hall Atrium** **ISU ClubFest – Sept. 8, 11am-4pm Great Hall, Memorial Union**
4	Sept. 14/16	***Presentations – Industrial Engineering, International Programs and Mechanical Engineering***		**E-Week 2010 - Sept. 13-21** **Career Skills Presentations Sept. 19- 20**
5	Sept.	***Attend Engineering Career Fair Sept. 21***	*Résumé due*	

	21/23	***12:00-6:00pm Hilton Coliseum/Scheman Presentations – Chemical Engineering and Software Engineering Departments***	*Academic Success Worksheet due*	
6	Sept. 28/30	***Presentation – Electrical Engineering and Computer Engineering Departments*** *Complete Explore Engineering Major Worksheet,* ***due Week 8***	*Career Fair Worksheet due*	Explore Engr. Major Worksheet
7	Oct. 5/7	Lecture: Curriculum Planning Registration & Scheduling / ISU policies & procedures *Complete Schedule Evaluation & Proposal Worksheet,* ***due Week 9***		SSH Electives SSH Requirements Schedule Evaluation & Proposal Wkst
8	Oct. 12/14	***Presentation - Construction Engineering Department*** Lecture: Midterms / Academic Recovery	*Explore Engineering Major Wkst due*	
9	Oct. 19/21	***Presentations – Materials Engineering Department***	*Schedule Eval & Proposal Wkst due*	**Midterm Grades** **Registration begins Oct. 21 for seniors**
10	Oct. 26/28	***Presentation – Agricultural Engineering & Biological Systems Engineering Departments***		**Last Day to drop a class - Oct. 29**
11	Nov. 2/4	***Presentations – Aerospace Engineering and Civil Engineering Departments*** Course Wrap-Up *Complete Course Evaluation on WebCt* **LAST DAY OF CLASS**	*Make sure you have made a student visit to an engineering department or club & turned in the worksheet.*	

Course Number and Name	Engr 160. Engineering Problems with Computer Applications Laboratory
Credits and Contact Hours	(2-2) Cr. 3. F.S.SS
Instructor/Course Coordinator	Martha Selby
Textbook and supplemental materials	a. Engr 160/160H custom published for Iowa State University, by Martha Selby. This is a custom published version from: Engineering Fundamentals and Problem Solving, by Arvid Eide, et. al. b. Courseworks Engr 160 packet (from bookstore)
Catalog Description	Solving engineering problems and presenting solutions through technical reports. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to mechanics, statistics and engineering economics. Use of spreadsheet programs to solve and present engineering problems. Solution of engineering problems using computer programming languages. (The honors section includes application of programming to mobile robotics).
Pre-requisites	MATH 142 or satisfactory scores on mathematics placement examinations; credit or enrollment in MATH 165
Required/Elective/Selected	Required of all engineering students (Basic Program)
Specific Outcomes	• Develop a systematic approach to solving engineering problems. o Demonstrate and practice problem solving skills by solving problems in various areas such as statics and engineering economy. • Use a computer programming language as a tool to solve engineering problems. o Develop an algorithm and flowchart for a problem solution o Following the flowchart, write a computer program that provides a friendly interface and useable output. • Produce professional, computer generated, project reports that conform to engineering presentation standards. o Use appropriate computer software to include computer generated graphs and tables in project reports. • Develop professional work ethics, including precision, neatness, and ability to follow instructions and meet deadlines.
Topics	See below

Week	Dates	Topics	Reading	Homework
1 (MW)	1/9, 1/11	Engineering Problem Solving & Presentation	Chap 4, p.77	4.7, 4.19, 4.27 Due: **1/23**
2 (MW)	**1/16(no class)**, 1/18	Dim., units and sig. figs Excel intro	Chap 6, p.139 Chap 7, p.159	6.12, 7.14, 7.17 Due: **1/30**
3 (MW)	1/23, 1/25	Graphing, Excel Flowcharting	Chap 5,p.99 Chap 3(7), p.53	**Please refer to the WebCT calendar**
4 (MW)	1/30, 2/1	VBA: Getting started in programming	Courseworks: VBA 1	**for up-to-date homework**
5 (MW)	2/6, 2/8	VBA: Controlling program flow	Courseworks: VBA 2	**information for the rest of the semester**
6 (MW)	2/13, **2/15-No class**	Review/ **NIGHT EXAM 1 Tuesday, 2/14, 8 – 10pm**		
7 (MW)	2/20, 2/22	Statistics Mechanics (statics)	Chap 10, p.235 Chap 11, p.267	
8 (MW)	2/27, 3/1	Statics continued	Chap 11, p.267	
9 (MW)	3/5, 3/7 3/6, 3/9	VBA: functions and subroutines	Courseworks: VBA 3	
---	**3/12 – 3/16**	**Spring Break**	---	
10(MW)	3/19, 3/21	VBA: file input/output, one-dimensional arrays	Courseworks: VBA 4 & 5	
11(MW)	3/26, 3/29	Programming continued, 1D arrays with subs		
12(MW)	4/2, **4/4-No class**	Review/ **NIGHT EXAM 2 Tuesday, 4/3, 8 - 10pm**		
13(MW)	4/9, 4/11	VBA: two-dimensional arrays, Excel programming	Courseworks: VBA 5	
14(MW)	4/16, 4/18	Engineering Economics	Chap 8, p.185 Chap 9, p. 227	
15(MW)	4/23 4/25	Economics continued, programming review		
16	**Finals Week**	See final schedule for Engr 160 group final time.		

Course Number and Name	**LIB 160. Information Literacy.**
Credits and Contact Hours	(1-0) Cr. 1. F.S.SS.
Instructor/Course Coordinator	Dr. Susan Vega-Garcia
Textbook and supplemental materials	none
Catalog Description	Eight-week course required for undergraduate degree. Provides a solid understanding of information literacy and the research process with emphases on finding, evaluating, and using scholarly information; the ethical and legal framework related to information use; and utilization of library discovery tools. To be taken as early as possible in the student's undergraduate career. See course descriptions of ENGL 150 and ENGL 250 for requirements related to LIB 160. Offered on a satisfactory-fail basis only
Pre-requisites	***For students whose native language is not English: Completion of ENGL 101 requirement.***
Required/Elective/Selected	required
Specific Outcomes	The purpose of Library 160 is to introduce students to the use of academic research libraries, available library services, and electronic information resources, with an emphasis on information literacy and the research process. This course promotes student self-directed learning at ISU, and provides a foundation for life-long learning.
Topics	

Course Number and Name	**MATH 165. Calculus I.**
Credits and Contact Hours	(4-0) Cr. 4. F.S.SS.
Instructor/Course Coordinator	Coordinator: Jennifer Davidson, Associate Chair
Textbook and supplemental materials	Varberg, Purcell, Rigdon , ***Calculus***, 9th edition
Catalog Description	Differential calculus, applications of the derivative, introduction to integral calculus. Only one of Math 151 or 160 or the sequence MATH 165-MATH 166, or the sequence MATH 181-MATH 182 may be counted towards graduation.
Pre-requisites	***Satisfactory performance on placement exam, 2 years of high school algebra, 1 year of geometry, 1 semester of trigonometry or enrollment in MATH 141 or MATH 142***
Required/Elective/Selected	required
Specific Outcomes	**Limits** • Use graphical and numerical evidence to estimate limits and identify situations where limits fail to exist. • Apply rules to calculate limits. • Use the limit concept to determine where a function is continuous. **Derivatives** • Use the limit definition to calculate a derivative, or to determine when a derivative fails to exist. • Calculate derivatives (of first and higher orders) with pencil and paper, without calculator or computer algebra software, using: o Linearity of the derivative; o Rules for products and quotients and the Chain Rule; o Rules for constants, powers, trigonometric and inverse trignometric functions, and for logarithms and exponentials. • Use the derivative to find tangent lines to curves. • Calculate derivatives of functions defined implicitly. • Interpret the derivative as a rate of change. • Solve problems involving rates of change of variables subject to a functional relationship. **Applications of the Derivative** • Find critical points, and use them to locate maxima and minima. • Use critical points and signs of first and second derivatives to sketch graphs of functions: o Use the first derivative to find intervals where a function is increasing or decreasing. o Use the second derivative to determine concavity and find inflection points. o Apply the first and second derivative tests to classify critical points. • Use Differential Calculus to solve optimization problems. **The Integral** • Find antiderivatives of functions; apply antiderivatives to solve separable first-order differential equations. • Use the definition to calculate a definite integral as a limit of approximating sums. • Apply the Fundamental Theorem of Calculus to evaluate definite integrals and to differentiate functions defined as integrals. • Calculate elementary integrals with pencil and paper, without calculator or computer algebra software, using: o Linearity of the integral;

	○ Rules for powers (including exponent *-1*) and exponentials, the six trigonometric functions and the inverse sine, tangent and secant; ○ Simple substitution. **Transcendental Functions** • Use the relation between the derivative of a one to one function and the derivative of its inverse. • Calculate with exponentials and logarithms to any base. • Calculate derivatives of logarithmic, exponential and inverse trigonometric functions. Use logarithmic differentiation. • Use models describing exponential growth and decay.
Topics	Topic — Chapter & Sections — Time Limits — Chapter §1.1, §§1.3-6, Optional: §1.2 Rigorous limits — 1 7 days The Derivative — Chapter 2 §§2.1-8, Optional: §2.9 Differentials and approximations — 12 days Applications of the Derivative — Chapter 3 §§3.1-5 §§3.8-9 Optional: §3.6 Mean Value Theorem Optional: §3.7 Solving equations — 11 days The Definite Integral — Chapter 4 §§4.1-5, Optional: §4.6 Numerical Quadrature — 11 days Transcendental Functions — Chapter 6 §§6.1-5, §6.8, Optional: §6.6 First-order linear differential equations, Optional: §6.7 Approximations for differential equations, Optional: §6.9 Hyperbolic functions — 10 days

Course Number and Name	**MATH 166. Calculus II.**
Credits and Contact Hours	(4-0) Cr. 4. F.S.SS.
Instructor/Course Coordinator	Coordinator: Jennifer Davidson, Associate Chair
Textbook and supplemental materials	Varberg, Purcell, Rigdon , ***Calculus***, 9th edition
Catalog Description	Integral calculus, applications of the integral, infinite series. Only one of MATH 151, MATH 160, the sequence MATH 165-MATH 166, or the sequence MATH 181-MATH 182 may be counted towards graduation.
Pre-requisites	***Grade of C- or better in MATH 165 or high math placement scores***
Required/Elective/Selected	required
Specific Outcomes	**Applications of the Integral** Set up and evaluate integrals to calculate • Area of a plane region • Volume of a solid of revolution • Length of a plane curve • Area of a surface of revolution • Work done by a variable force • Force due to fluid pressure • Moments and center of mass of a plane lamina, centroid of a plane region. **Techniques of Integration** • Evaluate integrals of trigonometric functions. • Use trigonometric and rationalizing substitutions to evaluate integrals. • Carry out integration by parts and apply it to evaluate integrals. • Use partial fractions to evaluate integrals of rational functions. **Indeterminate Forms and Improper Integrals** • Apply l'Hospital's Rule to evaluate limits having the indeterminate forms *0/0*, ∞/∞, *0·∞*, ∞−∞, *0^0*, ∞^*0* and *1^∞*. • Determine convergence or divergence of improper integrals; evaluate improper integrals that converge. **Infinite Series** • Apply limit rules to calculate limits of sequences. Apply the concept of boundedness to identify convergent monotonic sequences. • Use the concept of partial sum to distinguish between convergent and divergent series and to define the sum of a convergent series. • Recognize geometric series and collapsing series and calculate their sums when convergent. • Use the integral test, the comparison test, the limit comparison test and the ratio test to determine the convergence or divergence of series. Use the error estimate derived from the integral test to estimate sums or tails of series. • Recognize alternating series, and apply the alternating series test and associated error estimate. Identify absolutely convergent series. • Determine radius of convergence and convergence set of a power series. • Perform algebraic operations on power series. Apply term-by-term integration and differentiation to power series. • Expand a function in a Taylor series. Recall and use the Taylor series of elementary functions. • Use the remainder in Taylor's formula to estimate the approximation error in a Taylor polynomial. **Plane Parametric Curves, Polar Coordinates** • Derive parametric representations for plane curves described ``mechanically." • Find tangents and compute length for parametric curves.

	• Use polar coordinates, and convert between polar and rectangular coordinates. • Identify the polar equations for lines, circles and conics. • Compute the area of regions whose boundaries are defined by equations in polar coordinates.
Topics	Topic Chapter & Sections Time Applications of the Integral, §§5.1-6 Opt: Probability and Random Variables, §5.7 12 days Techniques of Integration §§7.1-6 11 days Indeterminate Forms, Improper Integrals §§8.1-4 7 days Infinite Series §§9.1-9 16 days Parametric Curves, Polar Coordinates §§10.4-7 5 days

Course Number and Name	**PHYS 221. Introduction to Classical Physics I.**
Credits and Contact Hours	(4.5-1) Cr. 5. F.S.SS.
Instructor/Course Coordinator	Instructors: Dr. Soeren Prell, Dr. Kai-Ming Ho, Dr. Anatoli Frishman Course Secretary: Deb Schmidt
Textbook and supplemental materials	*University Physics (12th Edition)*, Young and Freedman (Pearson, Addison Wesley 2008). If you are only taking Physics 221 and will not take Physics 222, you can get Volume 1 (Ch. 1-20) for Physics 221 only. **Required**: access code for Mastering Physics online homework system. Optional: *Student Solutions Manual* (available in the bookstore). This contains complete solutions to many end-of-chapter problems. Physics 221 Laboratory Manual (University Bookstore). We will be using the Turning Point RF Clickers in the lectures.
Catalog Description	For engineering and science majors. 3 hours of lecture each week plus 3 recitations and 1 laboratory every 2 weeks. Elementary mechanics including kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation. Heat, thermodynamics, kinetic theory of gases; waves and sound.
Pre-requisites	***Credit or enrollment in MATH 166***
Required/Elective/Selected	required
Specific Outcomes	None listed.
Topics	Date Class (lecture/recitation) Assignments Quizzes M Jan 10 1. Introduction, signif. figures, order of magnitude 1.1-1.6 T Jan 11 Worksheet 1: Units No quiz W Jan 12 2. Vectors, products, components Read: 1.7-1.10 R Jan 13 Worksheet 2: Vectors Online 0 (Fri.) F Jan 14 3. 1-dimensional motion Read: 2.1-2.4 M Jan 17 NO CLASS TODAY--- M.L.K. HOLIDAY T Jan 18 Worksheet 3: 1D motion Written 1 Q1: Lect. 1-2 W Jan 19 4. Free fall Read: 2.5-2.6 R Jan 20 Group Problem 1 (1D motion: Two submarines) Online 1 (Fri) F Jan 21 5. 2-Dim motion; projectiles Read: 3.1-3.3 M Jan 24 6. Circular motion Read: 3.4, 9.1-9.3 T Jan 25 Worksheet 4: 2D motion Written 2 Q2: Lect. 3-4 W Jan 26 7. Relative motion Read: 3.5 R Jan 27 NO RECITATION Online 2 (Fri.) F Jan 28 8. Forces; Newton's 1st and 2nd Laws Read: 4.1-4.4 M Jan 31 9. Newton's 3rd law; Free body diagrams Read: 4.5-4.6 T Feb 1 Worksheet 5: Newton's laws Written 3 Q3: Lect. 5-7 W Feb 2 10. Applications of Newton's laws Read: 5.1-5.2 R Feb 3 Group Problem 2 (Projectile motion: Mars probe) Online 3 (Fri.) F Feb 4 11. Friction; Circular motion dynamics Read: 5.3-5.4 M Feb 7 12. Examples T Feb 8 Worksheet 6: Forces Written 4 Q4: Lect. 8-10 W Feb 9 13. Work-kinetic-energy theorem Read: 6.1-6.2 R Feb 10 NO RECITATION Online 4 (Fri.) F Feb 11 14. Varying forces; power Read: 6.3-6.4 M Feb 14 15. Energy conservation; Potential energy Read: 7.1-7.3 T Feb 15 Worksheet 7: Work and energy Written 5 Q5: Lect. 11-12 W Feb 16 16. Examples R Feb 17 Group Problem 3 (Energy: Ski jump) EXAM 1 (COVERS LECTURES 1-14) Online 5 (Mon.) F Feb 18 NO LECTURE M Feb 21 17. Energy diagrams Read: 7.4-7.5 T Feb 22 Worksheet 8: Energy diagrams Written 6 Q6: Lect. 15-16 W Feb 23 18. Linear momentum and impulse Read: 8.1-8.2

	R	Feb 24	NO RECITATION Online 6 (Fri.)
	F	Feb 25	19. Elastic and inelastic collisions Read: 8.3-8.4
	M	Feb 28	20. Center of mass Read: 8.5
	T	Mar 1	Worksheet 9: Linear momentum and center of mass Written 7 Q7: Lect. 17
	W	Mar 2	21. Rigid body rotation: moment of inertia Read: 9.4-9.6
	R	Mar 3	Group Problem 4 (Collisions: Car insurance) Online 7 (Fri.)
	F	Mar 4	22. Torque Read: 10.1-10.3
	M	Mar 7	23. Rotations: work, power and examples Read: 10.4
	T	Mar 8	Worksheet 10: Rigid body motion Written 8 Q8: Lect. 18-20
	W	Mar 9	24. Angular momentum Read: 10.5-10.6
	R	Mar 10	NO RECITATION Online 8 (Fri.)
	F	Mar 11	25. Statics Read: 11.1-11.3
			MARCH 14 – 18 SPRING BREAK
	M	Mar 21	26. Elasticity. Read: 11.4-11.5
	T	Mar 22	Worksheet 11: Angular momentum and statics Written 9 Q9: Lect. 21-23
	W	Mar 23	27. Gravitation. Read: 12.1-12.5
	R	Mar 24	Group Problem 5 (Elasticity) Online 9 (Fri.)
	F	Mar 25	28. Periodic motion: the spring Read: 13.1-13.4
	M	Mar 28	29. The pendulum and damped oscillations Read: 13.5-13.8
	T	Mar 39	Worksheet 12: Gravitation Written 10 Q10: Lect. 24-27
	W	Mar 30	30. Mechanical waves, transverse waves. Read: 15.1-15.8
	R	Mar 31	EXAM 2 (COVERS LECTURES 15-27) NO RECITATION TODAY Online 10 (Mon.)
	F	Apr 1	NO LECTURE
	M	Apr 4	31. Sound waves. Energy, intensity. Resonance. Read: 16.1-16.3
	T	Apr 5	Worksheet 13: Oscillations Written 11 Q11: Lect. 28-29
	W	Apr 6	32. Interference. Standing waves. Beats. Doppler. Read: 16.4-16.8
	R	Apr 7	Group Problem 6 (Waves on string: Wind sculpture) Online 11 (Fri.)
	F	Apr 8	33. Temperature, thermometers, thermal expansion Read: 17.1-17.4
	M	Apr 11	34. Heat and phase changes. Read: 17.5-17.6
	T	Apr 12	Worksheet 14: Waves (Doppler and beats) Written 12 Q12: Lect. 30-32
	W	Apr 13	35. Heat transfer Read: 17.7
	R	Apr 14	NO RECITATION Online 12 (Fri.)
	F	Apr 15	36. Equations of state. Ideal gas. Kinetic model. Read: 18.1-18.4
	M	Apr 18	37. Phase diagrams. Read: 18.6
	T	Apr 19	Group Problem 7 (Heat transfer: Ice chest) Written 13 Q13: Lect. 33-34
	W	Apr 20	38. First law of thermodynamics. Read: 19.1-19.4
	R	Apr 21	Worksheet 15: First law Online 13 (Fri.)
	F	Apr 22	39. Therm. processes. Heat capacities. MAKEUP LAB WEEK Read: 19.5-19.9
	M	Apr 25	40. Heat engines and refrigerators. Read: 20.1-20.4
	T	Apr 26	Worksheet 16: Isothermal vs. adiabatic Written 14 Q14: Lect. 35-38
	W	Apr 27	41. Second law of thermodynamics. Carnot cycle. Read: 20.5-20.6
	R	Apr 28	NO RECITATION Online 14 (Fri.)
	F	Apr 29	42. Entropy. Read: 20.7

APPENDIX B: Faculty Resumes

Carl Bern, University Professor

Education

- Ph.D. Agricultural Engineering (major), Mechanical Engineering (minor), Iowa State University, 1973
- M.S. Agricultural Engineering, University of Nebraska, 1964
- B.S. Agricultural Engineering, University of Nebraska, 1963

Academic experience

- 2010-Present: University Professor (half-time)
- 2002-2010: University Professor (full-time)
- 1982-2002: Professor (full-time)
- 1967-1982: Graduate Teaching Assistant (part-time), Instructor, Assistant Professor, Associate Professor (full-time)
- 1964-1967: Instructor, Lynam Agricultural College, Stann Creek, Belize (full-time)
- 1963-1964: Graduate Research Assistant, University of Nebraska (part-time)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- Consultant for Tri-Phase Drying Technologies development of energy-efficient soybean dryer 2008-2012.

Certifications or professional registrations

- Professional Engineering Registration: 8679PE (Iowa, Agricultural)

Current membership in professional organizations

- American Society of Agricultural & Biological Engineers

Honors and awards

- ASABE Student Branch Faculty Member of the Year (2011)
- National Food and Energy Council Electric Technology Award, American Society of Agricultural and Biological Engineers (2005)
- ISU Foundation award for Outstanding Achievement in Teaching (2005)
- Massey-Ferguson gold medal award "For advancement of engineering knowledge and practice in agriculture" – American Society of Agricultural Engineers (2004)
- Fellow – American Society of Agricultural Engineers (1993)

Service activities (within and outside of the institution)

- Traveled to Copan State in NW Honduras with three students from St. Thomas Parish to work on corn storage issues and inspection of many steel silos used for corn storage on farms. Consulted with Ruben Rodrigues-Corea from the Honduras Department of Agriculture (2010).
- Worked on corn storage issues of subsistence farmers in the village of Shighatini, Tanzania, as part of a team from Bethesda Lutheran Church (2007).

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Bern, C.J., A Yakubu, T. J. Brumm. 2011. Hermetic maize storage systems for subsistence farmers. Proceedings of XXXIV CIOSTA CIGR V Conference 2011 University of Natural Resources and Applied Life Sciences, Vienna, Austria, June 29-July 1.
- Bern, C. J., Pate, M. B., Shivvers, S. 2011. Operating characteristics of a high-efficiency pilot scale corn distillers grain dryer. Applied Engineering in Agriculture 27(6):993-996.
- Keren, Nir, S. A. Freeman, J D. Harmon, C. J. Bern. 2011. Testing the effectiveness of an on-line safety module for engineering students. Accepted for publication in the *International Journal of Engineering Education*.
- Yakubu, A. S., C. J. Bern, J.R. Coats, T. B. Bailey. 2011. Hermetic on-farm storage for maize weevil control in East Africa. *African Journal of Agricultural Research* 6(14):3311-3319..
- White, S. D., P. T. Murphy, C. J. Bern, J. (Hans) van Leeuwen. 2010. Controlling deterioration of high- moisture maize with ozone treatment. *Journal of Stored Product Research*. 46(1):7-12.
- Bern, Carl, T. Brumm. 2009. Test weight deception. ISU Extension PMR 1005 (Peer reviewed)

Briefly list the most recent professional development activities

- Attended and presented a paper at XXXIV CIOSTA-CIGR V Conference, University of Natural Resources and Applied Life Sciences, Vienna, Austria. June 29-July 1, 2011.

Stuart Birrell, Associate Professor

Education

- Ph.D. Agricultural Engineering, University of Illinois, 1995
- M.S Agricultural Engineering, University of Illinois, 1987
- B.S. Agricultural Engineering, University of Natal, South Africa, 1984

Academic experience

- 2004-Present: Associate Professor, Agricultural & Biosystems Engineering (50% teaching; 50% research)
- 1998-2004: Assistant Professor, Agricultural & Biosystems Engineering (50% teaching; 50% research)
- 1996-1997 Visiting Assistant Professor, University of Illinois, Urbana-Champaign, IL
- 1992-1996: Research Assistant Professor. (Formerly Senior Research Specialist), University of Missouri, Columbia, MO

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

Certifications or professional registrations

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers (ASABE)

Honors and awards

- Frank Wilcoxon Prize for paper "Composite Response Surface Designs for Factors with Jointly Symmetric Effects" , 2010
- Editorial Board Member, Biosystems Engineering, 2009
- Kinze Manufacturing Professor, 2007

Service activities (within and outside of the institution)

- Chairman, College Engineering Curriculum Committee, 2006-2009
- Chairman of ASAE PM 54 Precision Agriculture Committee, 2001-2003
- Secretary of the Iowa Section of the ASAE, 2001-2002
- Iowa Section of the ASAE Newcomer of the Year, 2001
- PM-54 Precision Agriculture Committee for ASABE, 1996-present
- Invited Speaker, Evaluation of Corn Cob and Stover Removal levels on Crop Production, Soil Quality and Nutrient Levels for Different Single Pass Harvest Systems. Agricultural Equipment Technology Conference, Jan 5-7, 2011, Atlanta, GA
- Invited Speaker, POET Liberty Project Biomass Kickoff Meeting.

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Karkee, M., R.P. McNaull, S.J. Birrell and B.L. Steward. 2011. Estimation for Optimizal Biomass Removal Rate Based on Tolerable Soil Erosion for Single Pass Crop Grain and Biomass Harvesting System. Transactions of the ASAE. *Transactions of the ASABE*. 55(1): 107-115.
- Karlen, D.L., S.J. Birrell and J.R. Hess. 2011. Corn Stover Harvest Strategies: A Five-Year Assessment in Central Iowa, USA. Soil and Tillage 115-116:47-55.
- Karlen, D.L., G. Varvel, J, Johnson, J. Baker, S. Osborne, J. Novak, G. Roth, and S.J. Birrell. 2011. Monitoring Soil Quality to Assess the Sustainability of Harvesting Corn Stover. Agronomy Journal, 103(1):288.
- Chighladze, G., A. Kaleita and S. Birrell, 2010. Sensitivity of Capacitance Soil Moisture Sensors to Nitrate Ions in Soil Solutions, *Soil Sci. Soc. Am. J.* 74:1987-1996.
- Morris, M.D., B. Dilts, S.J. Birrell and P.M. Dixon. 2009. Composite response surface designs for factors with jointly symmetric effects. *Technometrics*: 206-214.
- Kim, H.J., J.W. Hummel, K.A. Sudduth, and S.J. Birrell. 2007. *Evaluation of phosphate ion-selective membranes and cobalt-based electrodes for soil nutrient sensing. Transactions of the ASABE*. 50(2): 415-425.
- Hoskinson, R.L., D.L. Karlen, S.J. Birrell, C.W. Radtke and W. W. Wilhelm. 2007. Engineering, soil fertility, and feedstock conversion evaluations of four corn stover harvest scenarios *Biomass and Bioenergy*, 1:126-136.

Briefly list the most recent professional development activities

- Agricultural Equipment Technology Conference (AETC), January 2011
- Bioenergy Engineering, October 2009
- ASABE Annual International Meeting, July 2009
- National Ethanol Conference, February 2009

Thomas Brumm, Associate Professor

Education

- Ph.D. Agricultural Engineering (with distinction) (minor in Chemical Engineering), Iowa State University, 1990
- M.S. Agricultural Engineering, Purdue University, 1980
- B.S. Agricultural Engineering (with distinction), Iowa State University, 1979

Academic experience

- 2011-Present: Professor-In-Charge, Engineering-LAS Online Learning, Colleges of Engineering and Liberal Arts and Sciences (full-time)
- 2010-2011: Professor-In-Charge, Engineering Online Learning, College of Engineering
- 2010-Present: Associate Professor, Agricultural and Biosystems Engineering (80% administration; 15% teaching; 5% research) (full-time)
- 2008-Present: Director of Assessment, College of Engineering
- 2006-2010: Associate Professor (50% administration; 25% teaching; 20% research)
    - Sustainable Agriculture faculty member (since 2001)
    - Biorenewable Resources and Technology faculty member (since 2003)
    - Graduate Faculty member (since 2000)
- 2000-2006: Assistant Professor (75% teaching; 25% research)
- 1991: Post- Doctoral Research Associate, Department of Agronomy, Iowa State University, Temporary Instructor, Agricultural Engineering
- 1990: Post-Doctoral Research Associate, Agricultural Engineering

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1996-2000: Technical Director, MBS Genetics, L.L.C., Story County, IA (full-time)
- 1991-1996: Technical Manager, MBS, Inc., Ames, IA (full-time)

Certifications or professional registrations

- Engineer-in-Training 1979

Current membership in professional organizations

- National Academic Advising Association
- American Society of Agricultural and Biological Engineers
- American Society for Engineering Education
- Epsilon Pi Tau

Honors and awards

- Thomas B. Thielen Award for Outstanding Service to the Student Body (2012)
- Iowa FFA Distinguished Service Award (2011)
- Iowa State University Coleman Faculty Entrepreneurship Fellow, The Coleman Foundation, Chicago, IL. (2010-2011)
- College of Agriculture and Life Sciences Learning Community Coordination Award (2010)

- Outstanding Learning Community Scholarship Award, Center for Excellence in Learning and Teaching, Iowa State University (2007)
- College of Agriculture and Life Sciences Outstanding Advisor Award (2006)

Service activities (within and outside of the institution)

- ABE Technology Curriculum Committee, member, vice-chair
- ABE Engineering Curriculum Committee, member
- Seed Science Curriculum Committee, member
- University Outcomes Assessment Committee
- College of Agriculture and Life Sciences Assessment Committee, member
- College Continuing Education Coordinator, College of Engineering
- BioBus student club faculty advisor
- airPad student club faculty advisor
- Cub Scout Pack 275 Cubmaster (2011) and Den Leader

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Bern, C., A Yakubu, T. Brumm. 2011. Hermetic maize storage systems for subsistence farmers. Proceedings of XXXIV CIOSTA CIGR V Conference 2011, University of Natural Resources and Applied Life Sciences, Vienna, Austria, June 29-July 1.
- Balascio, C., T. Brumm, and S. Mickelson. 2010. Competency-Based Assessment of Engineering Technology Programs Outcomes. 2010 Proceeding of the American Society for Engineering Education Annual Conference and Exposition.
- Saunders, K., T.J. Brumm, C. Brooke, S.K. Mickelson and S.A. Freeman, 2008. Assessing student work to support curriculum development: an engineering case study. Journal of Learning Communities Research 3(3): 47-62.
- Murphy, P.T., K.J. Moore, T.L. Richard, C.J. Bern and T.J. Brumm, 2007. Use of swine manure to improve solid-state fermentation in an integrated storage and conversion system for corn stover. Transactions of the ASABE 50(5): 1901-1906.
- Mickelson, S.K., P.C. Harms and T.J. Brumm, 2007. Longitudinal study of learning communities in agricultural and biosystems engineering. International Journal of Engineering Education 23(4): 672-682.

Briefly list the most recent professional development activities

- American Society of Agricultural and Biological Engineers, International Meeting Louisville, KY, 8/2011
- American Society for Engineering Education, Annual Meeting, Vancouver BC, 6/2011
- College Entrepreneurs' Organization National Conference, Chicago, IL, 11/2010
- Annual ABET Conference, Baltimore, MD, 10/2010

Matthew Darr, Assistant Professor

Education

- Ph.D. Food, Agricultural, and Biological Engineering, The Ohio State University, 2007
- M.S. Biosystems and Agricultural Engineering, University of Kentucky, 2004
- B.S. Food, Agricultural, and Biological Engineering, The Ohio State University, 2002

Academic experience

- 2008-Present: Assistant Professor (full-time) Iowa State University
- 2004-2007: Research Associate II (full-time) The Ohio State University
- 2002-2004: Research Assistant (part-time) University of Kentucky

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

Certifications or professional registrations

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- Iowa Section American Society of Agricultural and Biological Engineers
- North American ISOBUS Implementation Task Force

Honors and awards

- Early Achievement in Teaching Award. Iowa State University College of Agriculture and Life Sciences. (2012)
- Early Achievement in Research Award. Iowa State University College of Agriculture and Life Sciences. (2011)
- Gale A. Holloway Professional Development Award presented by ASABE. Recognized for outstanding leadership and active involvement in ASABE for early career members. (2009)
- Top paper award for Information and Electronic Technologies division of ASABE. (2008)
- Price Chair Award for Outstanding Teaching by a Staff Member. Annually awarded to a single staff instructor in the College of Food, Agricultural, and Environmental Sciences at The Ohio State University. (2006)

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Roth, J., M. J. Darr. 2011. Data acquisition system for soil-tire interface stress measurement. *Computers and Electronics in Agriculture*. Doi:10.1016/j.compag.2011.07.003.
- Medic, D., M. J. Darr, A. Shah, B. Potter, and J. Zimmerman. 2011. Effects of Torrefaction Process Parameters on Biomass Feedstock Upgrading. *Fuel*. Doi:10.1016/j.fuel.2011.07.019.

- Shah, A., M. J. Darr, D. Medic, R. Anex, D. Maski, and S. Khanal. 2011. Technoeconomic Analysis of a Production-scale Torrefaction System for Cellulosic Biomass Upgrading. *Biofuels, Bioproducts & Biorefining*. Doi:10.1002/bbb.336.
- Thoreson, C., M. J. Darr. 2011. Durability Analysis of Large Corn Stover Briquettes. *Applied Engineering in Agriculture*. In Press.
- Shah, A., M. J. Darr, K. Webster, and C. Hoffman. 2011. Outdoor Storage Characteristics of Single Pass Large Square Corn Stover Bales in Iowa. Energies. Doi:10.3390/en4101687.

Steven Freeman, Professor

Education

- Ph.D. Agricultural Engineering, Purdue University, 1993
- M.S. Agricultural Engineering, Texas A&M University, 1990
- B.S. Agricultural Engineering, Colorado State University, 1988

Academic experience

- Iowa State University, Ames, Iowa (8/97 - present)
    - Associate Director, Center for Excellence in Learning and Teaching (8/09 - present)
    - Professor, Agricultural and Biosystems Engineering (8/09 - present)
    - Assistant Director, Center for Excellence in Learning and Teaching (1/04 - 8/09)
    - Associate Professor, Agricultural and Biosystems Engineering (7/04 - 8/09)
    - Associate Professor, Industrial Education and Technology (8/03 - 6/04)
    - Assistant Professor, Industrial Education and Technology (8/97 - 8/03)
- Purdue University, West Lafayette, Indiana (8/90 - 8/97)
    - Agricultural Safety Specialist, Agricultural and Biological Engineering (1/94 - 8/97)
    - Visiting Instructor, Agricultural Engineering (7/93 - 5/94)
    - Graduate Research Fellow/Assistant, Agricultural Engineering (8/90 - 6/93)
- Texas A&M University, College Station, Texas (9/88 - 8/90)
  Graduate Research Fellow/Assistant, Agricultural Engineering
- Colorado State University, Fort Collins, Colorado (1/86 - 5/88)
    - Laboratory Assistant, Agricultural and Chemical Engineering

Non-academic experience

- Blue Spruce Safety Services, Owner/Operator, safety and health consulting and training (9/98 – present), part-time.

Certifications or professional registrations

- Certified Safety Professional (CSP). 2001. Board of Certified Safety Professional. Certificate No.: 16984.
- Certified Senior Technology Manager (CSTM). 2005. The Association of Technology, Management, and Applied Engineering. Certificate No.: 2015.
- Engineer-in-Training (EIT). 1987. State of Colorado, Board of Registration for Professional Engineers and Professional Land Surveyors. Registration No.: 15294.

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers (ASABE) *(1986 - present)*
- American Society for Engineering Education (ASEE) *(1992 - present)*
- International Society for Agricultural Safety and Health (ISASH) *(1993 - present)*
- American Society of Safety Engineers (ASSE) *(1995 - present)*
- Iowa Farm Safety Council *(1997 - present)*
- Association of Technology, Management, and Applied Engineering (ATMAE) *(1998 - present)*

- International Society for the Scholarship of Teaching and Learning (ISSOTL) *(2005 - present)*

Honors and awards

- Fulbright Specialist, Institute of International Education, U.S. Dept. of State (2011 - 2012)
- SENCER Leadership Fellow, National Center for Science and Civic Engagement (2008 - 2010)
- Learning Community Champion Award, Iowa State University (2008)
- Outstanding Industrial Technology Professor Award, National Association of Industrial Technology (2007)

Service activities (within and outside of the institution)

- President of the ISU Faculty Senate *(2011 - 2012)*
- ISU Senior Vice President and Provost Search Committee *(2012)*
- ISU President Search Committee (2011)
- Iowa Farm Safety Council Board of Directors *(1998 – present)*
- Chair, Journal of Technology, Management, and Applied Engineering Board (*2009 – present*)

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Withers, J.H., S.A. Freeman, and E. Kim. Learning & retention of chemical safety training information: A comparison of classroom versus computer-based formats on a college campus. Accepted for publication in *Journal of Chemical Health and Safety*.
- Ibrahim, N., **S.A. Freeman**, and M.C. Shelley. 2011. Identifying predictors of academic success for part-time students at polytechnic institutes in Malaysia. *International Journal of Adult Vocational Education and Technology* 2(4): 1-16.
- Mosher, G.A., **S.A. Freeman**, and C. R. Hurburgh, Jr. 2011. Design of an online course in quality management systems for adult learners. *Journal Industrial Technology* 27(4), http://www.atmae.org/jit/Articles/Mosher-Design-Online-Quality-Management-100611.pdf.
- Cena, L.G., N. Keren, W. Li, A.L. Carriquiry, M.D. Pawlovich, and S.A. Freeman. 2011. A Bayesian assessment of the effect of highway bypasses in Iowa on crashes and crash rate. *Journal of Safety Research* 42(2011): 241-252.
- Schwab, C.V. and S.A. Freeman. 2011. Pilot evaluation of an internet educational module for agricultural safety. *Journal of Extension* 49(3): www.joe.org.
- Keren, N., S.A. Freeman, J.D. Harmon, and C.J. Bern. 2011. Testing the effectiveness of an on-line safety module for engineering students. *International Journal of Engineering Education* 27(2): 284-291.
- Laux, C.M., G.A. Mosher, and S.A. Freeman. 2010. Factors affecting college students' knowledge and opinions of genetically modified foods. *Journal of Technology Studies* 36(2): 2-9.

Thomas Glanville, Professor

Education

- Ph.D. Civil Engineering, Iowa State University, 1987
- M.S. Civil Engineering, Iowa State University, 1975
- B.S. Engineering Operations, Iowa State University, 1972

Academic experience

- 2012-present: Professor (phased retirement)
- 2006-2012: Professor (full-time)
- 1997-2006: Associate Professor (full-time)
- 1988-1997: Assistant Professor (full-time)
- 1977-1988: Instructor (Extension) (full-time)
- 1974-1975: Graduate Research Assistant, Iowa State University (part-time)

Non-academic experience

- 1975-1977: Anderson Engineering, Des Moines, IA, Project Engineer, (full-time)
- 1973-1974: Caterpillar Tractor CO, Peoria, IL, Sales Engineer, (full-time)

Certifications or professional registrations (none)

Current membership in professional organizations

- American Society of Agricultural and Biological Engineering
- Iowa Groundwater Association

Honors and awards

- Honorary Scientist and Advisor, Rural Development Admin. Repub. of So. Korea (2011)
- Iowa State University College of Engineering Superior Engineering Extension Award (2008)
- Engineer of the Year, Mid–Central Conference ASABE (ASABE) (2005)
- Editorial Board, Compost Science & Utilization (2004)

Service activities (within and outside of the institution)

- Departmental Promotion, Tenure and Review Committee – Member (2010-11); Chair (2011-12)
- Editorial Board, Journal of Compost Science & Utilization, 2004-Present
- 4th International Symposium on Management of Animal Carcasses, Tissue, and Related Byproducts (scheduled May 2012). Member of steering and planning committees, co-chair of white paper committee.

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Glanville, T., D.J. Klingborg, M. Hutchinson, D. Rozeboom, and J. Bonhotal. 2011. Knowledgeable, Ready, Able: A Comprehensive Extension Agro-security Information

Program for the Livestock & Poultry Industries. (rated in top 3 in 2011 Extension Disaster Education Network Scholarly Paper Competition. Posted at: http://eden.lsu.edu

- Glanville, T.D. and D.D. Jones. 2011. Nonambulatory (Downer) Animals, Euthanasia, and Proper Disposal. In Cow-Calf Production in the U.S. Corn Belt. MWPS. Ia. State Univ. Ames, Iowa.
- Akdeniz, N., J.A. Koziel, T.D. Glanville, H.K. Ahn, B.P. Crawford. 2011. Air sampling methods for VOCs in field-scale bio-secure swine mortality composting. Bioresource Technology. 102:3599-3602.
- Akdeniz, N., J.A. Koziel, H.K. Ahn, T.D. Glanville, B.P. Crawford. 2010. Field scale evaluation of volatile organic compound production inside biosecure swine mortality composts. Waste Management. 30:1981-88.
- Akdeniz, N., J.A. Koziel, H.K. Ahn, T.D. Glanville, B.P. Crawford, D.R. Raman. 2010. Laboratory scale evaluation of volatile organic compound emissions as indication of swine carcass degradation inside biosecure composting units. Bioresource Technology. 101:71-78.
- Berge, A.C.B., T.D. Glanville, P.D. Millner, and D.J. Klingborg. 2009. Methods and microbial risks associated with composting of animal carcasses in the United States. Journal of American Veterinary Medical Association, 234(1) 47-56.

Recent professional development activities

- 2008-present -- Member, Professional Development Committee, College of Engineering, Iowa State University
- 2011—member of ISU College of Engineering Promotion and Tenure Review Committee
- 2011/12—Chair, ABE Promotion and Tenure Review Committee
- 2011—scientific review of manuscripts for *Environmental Science and Technology, Water, Air, and Soil Pollution, Virginia Cooperative Extension Service, Korean National Institute of Animal Science, Midwest Plan Service, and ISU Center for Food Safety and Public Health*
- 2011, Team Leader (5 authors) for award-winning scholarly white paper written for National Extension Disaster Education Network.

David Grewell, Associate Professor

Education

- Ph.D. Welding Engineering (minors in Biomedical Engineering and Polymer Processing), The Ohio State University, 2005
- M.S. Welding Engineering, The Ohio State University, 2002
- B.S. Welding Engineering (elective studies in Chemistry and Chemical Engineering), The Ohio State University, 1989

Academic experience

- 2010-Present: Associate Professor (full-time)
- 2005-2010: Assistant Professor (full-time)
- 2006-Present: Courtesy Appointment: Department of Civil, Construction and Environmental Engineering, Iowa State University
- 2007-Present: Courtesy Professor: Department of Polymer Processing, University of Erlangen-Nuremberg, Germany
- 2001-2005: Graduate Research Associate, The Ohio State University

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 2001-Present: Grewell Engineering Consultants, President, technical consulting and experimental research on plastic joining for industrial clients.
- 1997-2001: Branson Ultrasonic Corporation, Research Project Manager Infrared Welding, project management for the development of novel laser welding product line.

Certifications or professional registrations (none)

Current membership in professional organizations

- Ultrasonic Industrial Association
- American Society of Agricultural and Biological Engineers
- Society of Plastics Engineers

Honors and awards

- 2011 College of Agricultural and Life Science, Iowa State University, International Award
- Autodesk Scholarship, 2011, Attend Autodesk University for 1 week, 2011
- W. Wu-Haan, R. Burns, L. Moody, **D. Grewell**, R. Raman, Evaluation of Ultrasonic Pretreatment of Anaerobic Digestion of Different Animal Manures, American Society of Agricultural and Biological Engineers Honorable Mention Paper Award, August 2011
- United States Expert/Delegate for the International Institute of Welding Commission 16, Welding of Plastics and Adhesives Technology, July 16-22, 2011, Chennai India
- 2010 College of Agricultural and Life Science, Iowa State University, Early Achievement in Research Award

Service activities (within and outside of the institution)

- Work with Burke Corporation on plastic production sealing application (2010-2012)

- Work with Plastics Professionals on surface energy modifications (2010-2012)
- Work with Insite on bioplastic ground cover (2011-2012)
- Work with Creative Composites on lubrication product (2011-2012)
- Work with Seigwerk Ink Corp. on ultrasonic to reduce particle size of dies (2011-2012)
- Work with Connect-the-Docks on surface energy issues (2010)
- Participated in Workshop for Iraqi Borlaug Fellows and Mentors, International Center for Agricultural Research in Dry Area, May 23-26, 2010, Aleppo, Syria
- Developed novel polymer composite formulation for Pella Corp.

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Vogel, J., M. Kessler, S. Sundarajan, D. Grewell. 2012. Activation Energy for Diffusion and Welding of PLA Films, Polymer Engineering and Science, Accepted January 2012
- Pananuna, T., M. Montalbo-Lomboy, A. Noomhorm, D. Grewell, B. Lamsal. 2012. High-power Ultrasonication-assisted extraction of soybean isoflavones and effect of toasting, LWT - Food Science and Technology, accepted December 2011.
- Vogel, J., D. Grewell, M. Kessler, D. Drummer, and M. Menacher. 2011. Ultrasonic and impulse welding of polylactic acid films. Polymer Engineering & Science, 51(6), pp. 1059-1067.
- Juretic H. Dobrovic, S.; Ružinski, N.; Lovric, J.; Pecarevic, M.; Mikuš, J.; Crncevic, M.; Marcelja, E-J.; Marijanovic Rajcic, M.; Širac, S.; Cooper W. J.; Grewell, D.; van Leeuwen, J. (Hans). 2011. Pilot studies of ozonation for inactivation of Artemia salina nauplii in ballast water" Ozone: Sci. & Eng. 33(1) 3-13.
- Wu-Haan, W., R. Burns, L. Moody, D. Grewell, R. Raman. 2010. Evaluation of ultrasonic pretreatment on anaerobic digestion of different animal manures. Transactions of the ASABE 53(2): 577-583.

Briefly list the most recent professional development activities

- Possibilities and methods for modeling selecting beam melting in Erlangen, Germany, May 2012
- Annual Technical Conference for the Society of Plastic Engineers Proceedings (2011), Society of Plastic Engineers, Brookfield, CT
- Ultrasonics Industrial Association Annual Conference, San Francisco, April 2012
- AOCS Annual Meeting & Expo in Long Beach, California, May 2012
- Corn Utilization & Technology Conference, Indianapolis, June, 2012
- Ultrasonics Industrial Association Annual Conference, Glasgow, Scotland, March 2011
- Annual International Polymer Processing Society Conference, Morocco, Marrakech, July 2011
- International Composites Conference, Jeju Island, South Korea, August 21, 2011
- Bioplastics, Annual meeting at International Institute of Welding, Chennai India July 18, 2011

Mark Hanna, Extension Agricultural Engineer

Education

- Ph.D. Agricultural Engineering, Iowa State University, 1991
- M.S. Agricultural Engineering, Iowa State University, 1975
- B.S. Agricultural Engineering, Iowa State University, 1973

Academic experience

- 1987-Present: Extension Agricultural Engineer (full-time)
- 1973-1975: Teaching and Research Assistant, ISU (part-time)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1975-1987: Extension Soil, Water, and Waste Management Specialist, Atlantic and Council Bluffs (full-time)
- 1973: Caterpillar Tractor Co., Peoria, IL, summer design trainee (full-time)

Certifications or professional registrations

- Registered Professional Engineer in Iowa and Nebraska

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- American Association for the Advancement of Science
- American Society of Heating, Refrigerating and Air Conditioning Engineers
- International Society for Agricultural Safety and Health

Honors and awards

- Outstanding Achievement in Extension, College of Agriculture & Life Sciences
- Top 10 Agricultural Engineering Products in Last 20 years (Impellicone)
- ASABE Mid-Central Region Engineer of the Year Award
- ISU Professional & Scientific Award
- ASABE Rainbird Engineering Concept of the Year Award
- ASABE AE 50 Design Award
- Superior Engineering Extension Award

Service activities (within and outside of the institution)

ISU Extension:

- Natural resource and crops plan-of-work teams
- Stover harvest
- Missouri River flood taskforce
- Pesticide management and environment
- Program development process
- Awards

ASABE national committee membership:

- PM - 23/6 Chemical application (and X620 standard subcommittee, Agricultural machinery: safety for anhydrous ammonia application equipment)
- PM – 23/7/1 Grain harvest
- PM – 42 Cultural practices equipment
- PM – 45 Soil dynamics

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Hanna, H. M., and D. H. Jarboe. 2011. Effects of full, abbreviated, and no clean-outs on commingled grain during combine harvest. *Applied Engineering in Agriculture* 27(5):687-695.
- Hanna, H. M., B. L. Steward, and L. Aldinger. 2010. Soil loading effects of planter depth gauge wheels on early corn growth. *Applied Engineering in Agriculture*, 26(4):551-556.
- Hanna, H. M., D. H. Jarboe, and G.R. Quick. 2009. Grain residuals and time requirements for combine cleaning. *Applied Engineering in Agriculture*, 25(6):851-861.
- Hanna, H. M., A. Robertson, W. M. Carlton, and R. E. Wolf. 2009. Nozzle and carrier application effects on the control of soybean leaf spot diseases. *Applied Engineering in Agriculture*, 25(1):5-13.
- Zhou, X., M. J. Helmers, M. Al-Kaisi, and H. M. Hanna. 2009. Cost -benefit analysis of conservation management practices for sediment reduction in an Iowa agricultural watershed. *Journal of Soil and Water Conservation*, 64(5)314-323.
- Norman-Ham., H. A. H. M. Hanna, and T. L. Richard. 2008. Solid manure distribution by rear- and side-delivery spreaders. *Transactions of the ASABE*, 51(3):831-843.
- Bern, C. J., H. M. Hanna, and W. F. Wilcke. 2008. Harvesting, storage, and post-harvest management of soybeans. In Soybeans: Chemistry, Production, Processing, and Utilization, L. A. Johnson, P. J. White, and R. Galloway, editors. American Oil Chemists Press, Urbana, IL.

Briefly list the most recent professional development activities

- American Society of Agricultural and Biological Engineers International Meeting
- Sustainable Bioenergy Training
- Agricultural Equipment Technology Conference
- ISU Extension Annual Conference
- Agricultural Machinery Conference

Jay D. Harmon, Professor

Education

- Ph.D. Agricultural Engineering, Virginia Tech, 1989
- M.S. Agricultural Engineering, University of Minnesota, 1986
- B.S. Agricultural Engineering, Purdue University, 1984

Academic experience

- 2005-Present: Professor, Iowa State University (full-time)
- 1998-2005: Associate Professor, Iowa State University (full-time)
- 1993-1998: Assistant Professor, Iowa State University (full-time)
- 1989-1993: Assistant Professor, Clemson University (full-time)

Non-academic experience –

- 2008 – present: consultant for Murphy-Brown, LLC
- Other consulting with Hormel Foods, Premium Standard Farms, Murphy Family Ventures and the US Grain Counsel

Certifications or professional registrations

- Professional Engineer

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- National Frame Builders Association
- American Society of Heating, Refrigerating and Air Conditioning Engineers

Honors and awards

- American Society of Agricultural and Biological Engineers (ASABE) Fellow (2011)
- ASABE Henry Giese Structures and Environment Award (2011)
- ASABE Presidential Distinguished Service Award (2010)
- ISU College of Agriculture and Life Sciences Dean's Citation for Extraordinary Contributions to the College (2009)

Service activities (within and outside of the institution)

- Midwest Plan Service - MWPS is comprised of extension and research agricultural engineers from 12 Midwestern universities with headquarters at Iowa State University. MWPS produces educational publications for the agricultural audience. Professor-in-charge (2005-present)
- North Central Region Committees
    - NCR-89, Swine Management Research Committee (1995-present)
    - NCR-9 MWPS (1994-present)
- Iowa State University
    - Art in State Building Committee, 2011-present, chair
    - COE Promotion and Tenure Committee, 2011-2012
    - Biorenewables Complex Steering Committee, 2007-present

- Midwest Rural Energy Counsel Board of Directors, 2003-present
- ASABE
    - Board of Trustees, 2012-2014
    - Representative to the NCEES Examinations for Professional Engineers Committee, 2009-2012
    - Ag Engineering PE Exam Development Committee, 2004-present

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Tyndall, J.C., N. Grudens-Schuck, J.D. **Harmon** and S.J. Hoff. 2012. Social Approval of the Use of the Community Assessment Model for Odor Dispersal: Results from a Citizen Survey. *Environmental Management.* Accepted.
- Harmon, J.D., M.C. Brumm, L.D. Jacobson, S.H. Pohl, D.R. Stender, and R.R. Stowell. 2012. Field Performance Evaluation of a Ventilation System: A Swine Case Study. *Applied Engineering in Agriculture.* In press.
- Li, H., H. Xin, R.T. Burns, L.D. Jacobson, S. Noll, S.J. Hoff, J.D. Harmon, J.A. Koziel and B.P. Heckler. 2011. Air Emissions from Tom and Hen Turkey Houses in the US Midwest. Transactions of the ASABE 54(1): 305-314.
- Davis, J.D., M.J. Darr, H. Xin, J.D. Harmon and J.R. Russell. 2011. Development and use of a GPS herd activity and well-being kit (GPS HAWK) to monitor cattle behavior and the effect of sample interval on travel distance. Appl. Engr. In Ag. 27(1): 143-150.
- Energy Conservation in Swine Barns. Iowa Energy Summit. October 18, 2011. Ames, IA. *Invited.*
- ISU Research, Programs and Assistance. IPPA. September 7, 2010. *Invited.*
- Air Quality and Livestock: An Iowa Perspective. Wisconsin DNR. May 11, 2010. *Invited.*
- Lammers, P.J., M.S. Honeyman, J.D. Harmon, and M.J. Helmers. 2010. Energy and carbon inventory of Iowa swine production facilities. Agricultural Systems 103:551–561.
- Honeyman, M.S., W.D. Busby, S.M.Lonergan, A.K. Johnson, D.L. Maxwell, J.D. Harmon, and S.C. Shouse. 2010. Performance and carcass characteristics of finishing beef cattle managed in a bedded hoop-barn system. Journal of Animal Science 88:2797–2801.
- Lammers, P.J., M.D. Kenealy, J.B. Kliebenstein, J.D. Harmon, M.J. Helmers, and M.S Honeyman. 2010. Non-solar energy use and 100-year global warming potential of Iowa swine feedstuffs and feeding strategies. Journal of Animal Science 88:1204–1212.
- Hoff, S.J., J.D. Harmon, L. Chen, K.A. Janni, D.R. Schmidt, R.E. Nicolai, L.D. Jacobson. 2009. Partial Biofiltration of a Hybrid Ventilated Deep-Pit Swine Finisher. Applied Engineering in Agriculture 25(2): 269-280.

Briefly list the most recent professional development activities

- Webinar on Post-Frame Design, May 2012
- Attendance of ASABE conference, Louisville, KY, August 2011
- Development of AgE PE Exam, Seneca, SC, February 2011
- Attendance of ASABE conference, Pittsburgh, PA, June 2010

Matt Helmers, Associate Professor

Education

- Ph.D. Ag & Biological Systems Engineering, University of Nebraska-Lincoln, 2003
- M.S. Civil Engineering, Virginia Polytechnic Institute and State Univ., 1997
- B.S. Civil Engineering, Iowa State University, 1995

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time

- 2009-Present: Associate Professor, ISU (full-time)
- 2003-2009: Assistant Professor, ISU (full-time)
- 1999-2003: USDA National Needs Graduate Fellow, Agricultural & Biological Systems Engineering, University of Nebraska-Lincoln

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1997-1999: Staff Engineer, URS Greiner Woodward-Clyde, Santa Ana, CA, and Denver, CO

Certifications or professional registrations

- Engineer in Training Certification (1995)

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers (ASABE)
- American Society of Civil Engineers
- American Water Resources Association
- Soil and Water Conservation Society
- Soil Science Society of America

Honors and awards

- Member of Team that received Iowa State University Extension Team Award – Organizational (2009)
- ASABE Nolan Mitchell Young Extension Worker Award (2009)
- Iowa State University Early Achievement in Extension (2007)
- College of Agriculture Early Achievement in Extension (2007)
- ASABE Blue Ribbon Award in the Educational Aids Competition for publication "Drainage Water Management for the Midwest" (2007)

Service activities (within and outside of the institution)

- ASABE Committees
    - Member SW-02 (Steering)
    - Member SW-04 (Program)
    - Member SW-21 (Hydrology)
    - Member Nomenclature Committee (SW-07)
    - Member SW-23 (Drainage) (chair 2011-present)
    - Member SW-06 (Paper Awards)

- Associate Editor for Transactions of ASABE and Applied Engineering in Agriculture
- ABE Awards Committee Chair (2010-Present)
- ABE Social Committee (2004-present)
- ABE Research Farms Committee (2004-present)
- Member of search committee for Director of the Leopold Center for Sustainable Agriculture
- Member of Agriculture and Natural Resources Extension Crop Care Team
- Member of the State Nutrient Reduction Strategy Team – Lead of the Nitrogen Team
- Member of Cedar River Watershed Technical Team
- Member of HUD Watershed Demonstration Pilot Project Advisory Committee
- Member of 4-mile Creek Watershed Technical Team

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Schilling, K., P. Jindal, N. Basu, and M.J. Helmers. 2011. Impact of artificial subsurface drainage on groundwater travel times and baseflow discharge in an agricultural watershed, Iowa (USA). *Hydrological Processes* DOI: 10.1002/hyp.8337.
- Andersen, D.S.*, R.T. Burns, L.B. Moody, and M.J. Helmers. 2011. Using total solids concentration to estimate nutrient content of feedlot runoff effluent from solid settling basins, vegetative infiltration basins, and vegetative treatment areas. *Applied Engineering in Agriculture* 27(5): 803-810.
- Lawlor, P.A.*, M.J. Helmers, J.L. Baker, S.W. Melvin, and D.W. Lemke. 2011. Comparison of liquid swine manure and ammonia nitrogen application timing on subsurface drainage water quality in Iowa. *Trans. ASABE* 54(3): 973-981.
- Helmers, M.J., X. Xhou*, J.L. Baker, S.W. Melvin, and D.W. Lemke. Nitrogen loss on tiledrained Mollisols as affected by nitrogen application rate under continuous corn and cornsoybean rotation systems. Accepted March 2011 to *Canadian Journal of Soil Science.*
- Qi, Z.*, M. J. Helmers, R. Malone, and K. Thorp. 2011. Simulating long-term impacts of winter rye cover crop on hydrologic cycling and nitrogen dynamics for a corn-soybean crop system.*Trans. ASABE* 54(5): 1575-1588.
- Dosskey, M. G., M. J. Helmers, and D. E. Eisenhauer. 2011. A design aid for sizing filterstrips using buffer area ratio. Journal of Soil and Water Conservation 66(1): 29-39.
- Qi, Z.*, M. J. Helmers, and A. Kaleita. 2011. Soil water dynamics under various land covers in Iowa. Agricultural Water Management 98(4): 665-674.
- Stenback, G., W. Crumpton, K. Schilling, and M. J. Helmers. 2011. Rating curve estimation of nutrient loads in Iowa rivers. Journal of Hydrology 396: 158-169.

Briefly list the most recent professional development activities

- American Geophysical Union Meeting, San Francisco, CA 2011
- USDA-AFRI Managed Ecosystems Project Investigators Meeting, Washington, DC 2011
- Soil Science Society of America International Meeting, San Antonio, TX 2011
- International Symposium on Soil Quality and Management of World Mollisols 2010

Steven Hoff, Professor

Education

- Ph.D. Agricultural Engineering, University of Minnesota, 1990
- M.S. Agricultural Engineering, University of Minnesota, 1987
- B. Ag. Eng. Agricultural Engineering (with high distinction), University of Minnesota, 1985
- B.S. Agricultural Engineering Tech, University of Wisconsin-River Falls, 1983

Academic experience

- 2005-Present: Professor (full-time) Iowa State University
- 1995-2005: Associate Professor (full-time) Iowa State University
- 1990-1995: Assistant Professor (full-time) Iowa State University
- 1985-1990 Graduate Research Assistant University of Minnesota

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

Certifications or professional registrations

- Professional Engineering, State of Iowa (since 1999)

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers (ASABE)
- Air & Waste Management Association (A&WMA)
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
- American Society of Engineering Education (ASEE)

Honors and awards

- Dean Lee R. Kolmer Award for Excellence in Applied Research (2011)
- Fellow, American Society of Agricultural and Biological Engineers (2010)
- Agricultural and Biosystems Engineering Faculty Member of the Year (2010)
- ISU College of Agriculture and Life Sciences Team Award (2009)
- Dean's Citation for Extraordinary Contributions to the College of Agriculture and Life Sciences (2009)

Service activities (within and outside of the institution)

- Director of Graduate Education, Agricultural and Biosystems Engineering
- ABE Graduate Programs Committee, Chair
- Faculty Senate, ISU
- ABE Engineering Curriculum Committee, member
- Program Review Panel, BARD, Sub-program Chair

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Cutler T.D., C. Wang, S.J. Hoff and J.J. Zimmerman. 2012. Effect of temperature and relative humidity on ultraviolet (UV254) inactivation of airborne porcine respiratory and reproductive syndrome virus. *Veterinary Microbiology* (in press).
- Sun, G. and S.J. Hoff. 2011. Simulation of Impacts of Different Animal Management Practices and Geographical Area on Long-Term Air Quality. *Transactions of the ASABE*, 54(4): 1465-1477.
- Cutler T.D., C. Wang, Q. Qin, F. Zhou, K. Warren, K-J Yoon, S.J. Hoff, J. Ridpath, and J.J. Zimmerman. 2011. Kinetics of UV254 inactivation of selected viral pathogens in a static system. *Journal of Applied Microbiology*, 111(2): 389-395.
- Tyndall, J., J.D. Harmon, S.J. Hoff, and N. Grudens-Schuck. 2011. A User Evaluation of a Decision-Support System: The Community Assessment Model for Odor Dispersion (CAM). *Journal of Extension*, 49(4): Article Number 4FEA7.
- Cutler, T.D., C. Wang, S.J. Hoff, A. Kittawornrat and J.J. Zimmerman. 2011. Median Infectious Dose (ID50) of Porcine Reproductive and Respiratory Syndrome Virus Isolate MN-184 via Aerosol Exposure. *Veterinary Microbiology*, 15(3-4): 229-37.
- Sun, G., R. F. Fitzgerald, K. J. Stalder , L. A. Karriker, A. K. Johnson, and S. J. Hoff. 2011. Development of an embedded microcomputer-based force plate system for measuring sow weight distribution and detection of lameness. *Applied Engineering in Agriculture*, 27(3): 475-482.
- Li, H., H. Xin, R.T. Burns, L.D. Jacobson, S. Noll, S.J. Hoff, J.D. Harmon, J.A. Koziel and H.P. Hetchler. 2011. Air Emissions from Tom and Hen Turkey Houses in the U.S. Midwest. *Transactions of the ASABE* 54(1): 305-314.
- Irwin, C.K., K.J. Yoon, C. Wang, S.J. Hoff, J.J. Zimmerman, T. Denagamage and A.M. O'Connor. 2011. Using the Systematic Review Methodology to Evaluate Factors that Influence the Persistence of Influenza Virus in Environmental Matrices. *Applied and Environmental Microbiology* 77(3): 1049-1060.
- Sun, G. and S.J. Hoff. 2010. Prediction of indoor climate and long-term air quality using the BTA-AQP model and typical meteorological year: Part II. Overall model evaluation and application. *Transactions of the ASABE* 53(3): 871-882.
- Sun, G. and S.J. Hoff. 2010. Prediction of indoor climate and long-term air quality using the BTA-AQP model and typical meteorological year: Part I. BTA model development and evaluation. *Transactions of the ASABE* 53(3): 863-870.
- Tyndall, J., J.D. Harmon, and S.J. Hoff. 2010. Swine producer appraisal of the community assessment model for odor dispersion (CAM). *Applied Engineering in Agriculture* 26(5): 927-933.
- Zhang, S. L. Cai, J.A. Koziel, S.J. Hoff, D. Schmidt, C.J. Clanton, L.D. Jacobson, D.B. Parker and A.J. Heber. 2010. Field air sampling and simultaneous chemical and sensory analysis of livestock odorants with sorbent tubes and GC-MS/Olfactometry. *Sensors & Actuators B. Chemical* 146(2): 427-432.
- Chen, L.D. and S.J. Hoff. 2009. Mitigating odors from agricultural facilities: A review of literature concerning biofilters. *Applied Engineering in Agriculture* 25(5): 751-766.

Briefly list the most recent professional development activities

- Attended a workshop on humidity sensing technology sponsored by Vaisala, Inc., St. Louis, MO May 7-8, 2011

Charles Hurburgh, Professor

Education

- Ph.D. Agricultural Engineering, Iowa State University, 1981
- M.S. Agricultural Engineering, Iowa State University, 1980
- B.S. Agricultural Engineering, Iowa State University, 1973

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time

Iowa State University

- 1995-Present: Professor (30% extension; 70% research)
- 1991-1994: Professor (30% teaching; 70% research)
- 1985-1991: Associate Professor (30% teaching; 70% research)
- 1982-1985: Assistant Professor (25% teaching; 75% research)
- 1978-1982: Instructor (25% teaching; 75% research)
- 1976-1978: Instructor (full-time teaching)
- 1976: Graduate Research Assistant

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1972-1976: Operated family cash grain farm (1000 acres corn, soybeans) (full-time)

Certifications or professional registrations

Current membership in professional organizations

- American Society of Agricultural Engineers (ASAE)
- American Society of Cereal Chemists (AACC)
- Iowa Academy of Science (IAS)
- Grain Elevator and Processing Society (GEAPS)
- American Oil Chemists Society (AOCS)
- Society for Applied Spectroscopy (SAS)
- International Diffuse Reflectance Council (IRDC)
- Council on Near-Infrared Spectroscopy (CNIRS)

Honors and awards

- Extension Service Award, College of Engineering (2010)

Service activities (within and outside of the institution)

- NC-213 USDA regional research committee, Marketing and Delivery of Quality Cereals and Oilseeds, Iowa State University representative (1978-present). Chair 1990-91. Iowa Contribution Station project 3261, Principal investigator
- ISO22000, Food Safety and Quality Management Systems, TC34, WG17. US Expert Group (2009 – present)
- AACC Food Safety Audit Task Force. (2009-present)

- U.S. Technical Advisory Group, ISO Technical Committee TC34, working group 7 (biotechnology testing) and working group 12 (traceability) (2001-present)
- College of Agriculture/Extension Ag Quality Initiative (2001- present, co-chair)
- Council on Near Infrared Spectroscopy Associate Editor (2003 – present)

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Robertson, A.E., Munkvold, G.P., Hurburgh, C.R. and Ensley, S. 2011. Impact of hail damage during early reproductive stages on ear rot and mycotoxin contamination of maize. *Phytopathology* 100: S109
- Thakur, M., Carl-Fredrik Sørensen; Finn Olav Bjørnson; EskilForås; Charles R Hurburgh.. 2011. Managing food traceability information using EPCIS framework. *Journal of Food Engineering*: 103 (4): 417-433
- Sylvie A. Roussel, Benoît Igne, David B. Funk, Charles R. Hurburgh . 2011. Noise Robustness Comparison for Near Infrared Prediction Models. *JNIRS* 19:23-26
- Mosher, G. A., S. A. Freeman, and C. R. Hurburgh. 2011. Design of an Online Course in Quality Management Systems for Adult Learners. *Journal of Industrial Technology* 27(4): online
- Esteve Agelet, Lidia, David D. Ellis, Susan Duvick, A. Susana Goggi, Charles R Hurburgh, and Candice A. Gardner. 2011. Feasibility of Near Infrared Spectroscopy for Analyzing Corn Kernel Damage and Viability of Soybean and Corn Kernels. *Journal of Cereal Science*: http://dx.doi.org/10.1016/j.jcs.2011.11.002

Briefly list the most recent professional development activities

- American Society of Cereal Chemists (AACC) annual meetings 2010,2011
- Grain Elevator and Processing Society (GEAPS) annual meetings 2010, 2011, 2012
- American Oil Chemists Society (AOCS) annual meetings 2010, 2011, 2012
- Council on Near-Infrared Spectroscopy (CNIRS) annual meeting 2010

Amy Kaleita, Associate Professor

Education

- Ph.D. Agricultural Engineering, University of Illinois at Urbana-Champaign, 2003
- M.S. Civil Engineering, University of Illinois at Urbana-Champaign, 1999
- B.S. Agricultural Engineering, The Pennsylvania State University, 1997

Academic experience

- 2009-Present: Associate Professor (full-time)
- 2003-2009: Assistant Professor (full-time)
- 2000-2003: Graduate Research Fellow, University of Illinois (part-time)
- 1997-2000: Graduate Research Fellow, Environmental Hydrology and Hydraulic Engineering Laboratory, University of Illinois

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1999: Summer Graduate Fellow, NASA Goddard Space Flight Center, Greenbelt, MD
- 1997: Student research assistant, USDA ARS Pasture Systems and Watershed Management Research Laboratory, University Park, PA

Certifications or professional registrations

- Certified as Engineer in Training (EIT) by the Commonwealth of Pennsylvania (1997)

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers (ASABE)
- American Society for Engineering Education
- International Association of Hydrological Sciences
- Alpha Epsilon Honor Society of Agricultural, Food, and Biological Engineering (initiated 1996)
- Tau Beta Pi Engineering Honor Society (initiated 1995)

Honors and awards

- Young Engineer of the Year, ASABE Iowa Section (2011)
- Superior Engineering Teacher Award, ISU College of Engineering (2010)
- A.W. Farrall Young Educator Award, ASABE (2008)
- New Teacher Award, U.S. Dept. of Agriculture and the National Association of State
- Universities and Land-Grant Colleges (2007)
- Teaching Award of Merit, North American College Teachers of Agriculture (NACTA) and ISU College of Agriculture (2006)

Service activities (within and outside of the institution)

- ABE Engineering Curriculum Committee member (2003-present)
- ABE Promotion, Tenure and Review Committee member (AY 2004, 2006, 2009, 2011)
- College of Engineering Honors Program Chair (2009-present) and ABE representative to Honors Program committee (2005-present)

- Alpha Kappa Lambda Fraternity Psi Chapter advisor (2007-present)
- AirPad Student Design Club advisor (2010-present)
- Soil and Water Conservation Society ISU chapter advisor (2010-present)
- Tau Beta Pi (Engineering Honor Society) Iowa Alpha Chapter advisor (2003-present)

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Qi, Z., M. Helmers, and A. Kaleita. 2011. Soil water dynamics under various agricultural land covers on a subsurface drained field in north-central Iowa, USA. Agricultural Water Management, 98(4): 665-674.
- Chighladze, G., A. Kaleita, and S. Birrell. 2010. Sensitivity of capacitance soil moisture sensors to nitrate ions in soil solution. Soil Science Society of America Journal, 74: 1987-1995.
- Logsdon, S.D., T.J. Sauer, G. Hernandez- Ramirez, J.L. Hatfield, A. Kaleita, J.H. Prueger. 2010. Effect of corn or soybean row position on soil water. Soil Science, 175: 530-534.
- Newman, J.K., A. L. Kaleita, and J. Laflen. 2010. Soil erosion hazard maps for corn stover management using NRI data and WEPP. Journal of Soil and Water Conservation, 65(4): 211-222.
- Singh, R., M. J. Helmers, A. L. Kaleita, and E. S. Takle. 2009. Potential Impact of Climate Change on Subsurface Drainage in Iowa's Subsurface Drained Landscapes. Journal of Drainage and Irrigation Engineering, 135(4): 459-466.
- Maeda, E.E., A.R. Formaggio, A.R. Shimabukuro, and **A. L. Kaleita**. 2009. Impacts of agricultural expansion on surface runoff: A case study of a river basin in the Brazilian Legal Amazon. *International Journal of Geoinformatics* (online) 5(3).
- Gelder, B.K., A. L. Kaleita, and R.C. Cruse. 2009. Estimating field mean residue cover on Midwestern soils using satellite imagery. Agronomy Journal, 101(3): 635-643.

Briefly list the most recent professional development activities

- Annual International Meeting of the American Society of Agricultural Engineers, Louisville, KY (Moderated "Curricular Issues in Agricultural & Biological Engineering" rap session), 2011
- Annual International Meeting of the American Society of Agricultural Engineers, Pittsburg, PA (Moderated "Innovations in Undergraduate and Graduate Education" session), 2010
- 40th Biological Systems Simulation Conference, Maricopa, AZ (Invited panelist for summary session), 2010
- Visited Georgia Technical University, the agricultural university of Georgia, and the state university of Georgia, Tbilisi, to consult on development of water resources master's degree, present a seminar on active learning in soil and water engineering courses, and collect data and electronic media for development of case studies for use in ISU courses, 2006

Ramesh Kanwar, C.F. Curtiss Distinguished Professor

Education

- Ph.D. Agricultural Engineering, Iowa State University, 1981
- M.S. Agricultural Engineering, G.B. Pant Univ. Ag & Tech, India, 1975
- B.S. Agricultural Engineering, Pb Agr. Univ., India, 1969

Academic experience

- 2011-Present: Vice Chancellor, Lovely Professional University, India
- 2011-Present: C.F. Curtiss Distinguished Professor of Agricultural and Biosystems Engineering
- 2001- 2011: Professor and Department Chair, Department of Agricultural and Biosystems Engineering (ABE) at Iowa State University.
- 1999-2002: Director, Iowa State Water Resources Research Institute (ISWRRI).
- 1997-2001: Assistant Director, Iowa Agricultural and Home Economics Experiment Station at Iowa State University.
- 1991-1997: Director of Graduate Education, Department of Agricultural and Biosystems Engineering, Iowa State University.
- 2001-Present: Member of Faculty, Environmental Sciences and Sustainable Agriculture.
- 1991-Present: Professor of Agricultural and Biosystems Engineering at Iowa State
- 1993-1996: International Agriculture Professor, College of Agriculture, Iowa State
- 1986-1991: Associate Professor of Agricultural Engineering at Iowa State
- 1983-1986: Assistant Professor of Agricultural Engineering at Iowa State

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1969: Junior Engineer with H.P. Government, India

Certifications or professional registrations

- American Institute of Hydrology – certification as Professional Hydrologist-Water Quality, 1995

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- International Association of Hydrological Sciences
- Asian Association for Agricultural Engineering, foundation member
- International Commission on Irrigation and Drainage, life member
- Indian Science Congress Association, life member

Honors and awards

- Fellow, Indian Society of Agricultural Engineers (Feb. 2012)
- AAAE Sakai Science and Technology Award (2010)
- John Deere Gold Medal Award from ASABE (2009)
- Superior Paper Award from ASABE (2009)
- International Award of Merit from Gamma Sigma Delta (2009)

Service activities (within and outside of the institution)

- Panel member to review USAID funded programs for Phillipines
- Administrative advisor to two NECERA committees
- ISU Provost's Distinguished Professor Awards Committee

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- D.L. Hoag, J.C. Ascough Ii, E.M. Fathelrahman, R.W. Malone, P. Heilman, L.J. Wiles, and **R. S.** Kanwar. 2011. Continuum of risk analysis methods to assess tillage system sustainability at the experimental plot level. *Journal of Sustainability 3*(7):1035-1063.
- P.N. Rekha, R. S. Kanwar, A.K. Nayak, C.K. Hoang, and C.H. Pederson. 2011. Nitrate leaching to shallow groundwater systems from agricultural fields with different management practices. *Journal of Environmental Monitoring* 13:2550-2058
- Kanwar, R.S. and A. Bakhsh. 2011. Longterm effects of tillage, crop rotation, and nitrogen management systems on water use and groundwater quality. *J Agric. Engr*., 48(1):12-20.
- Fathelrahman, E.M., J. C. Ascough II, D.L. Hoag, R.W. Malone, P. Heilman, L. J. Wiles
- and R. S. Kanwar. 2011. Economic and stochastic efficiency comparison of experimental tillage systems in corn and soybean under risk. *Experimental Agriculture*, 47(1):111-136.
- Bakhsh, A., R.S. Kanwar and J.L. Baker. 2010. N-Application Methods and Precipitation Effects on Subsurface Drainage Nitrate Losses and Crop Yields. Water, Air, Soil Pollut. J. 212: 65-76.
- Hoang, Chi, R.S. Kanwar, and C. Pederson. 2010. Phosphorus losses through subsurface drainage in a loamy soil of Iowa: effects of rates, timing, and method of swine manure
- and fertilizer application. *International Agricultural Engineering Journal*, 19(1):1-9.
- Kanwar, R.S. 2010. Sustainable Water Systems for Agriculture and 21st Century Challenges. *Journal of Crop Improvement*, 24:1–19.
- Guzman, J., G.A. Fox, R. Malone, and R.S. Kanwar. 2009. Escherichia coli transport from surface applied manure to subsurface drains through artificial biopores. *J. Environmental Quality*, 38(6): 2412-2421.

Briefly list the most recent professional development activities

- Attended PhD Scholars Day at Indian Institute of Technology, Kharagpur, March 10-11, 2012.
- Attended "World Education Congress" held at Lovely Professional University, Jalandhar, India from April 4-6, 2012. This international conference was organized by Global Educational and Research Association.
- Attended "Adventures in Academic Leadership" workshop at Lovely Professional University, India on May 3-4, 2012. This workshop was delivered by Dr. Jim Melsa and Dr. Walt Gmelch from the USA.
- Attended Sino-US Symposium on Animal Waste Treatment & Bioenergy Production organized by China Univ. Chemical Engr and Tech, USDA-FAS, and Univ. of California in Beijing, China, May 28-29, 2011.

Nir Keren, Associate Professor

Education

- Ph.D. Interdisciplinary Engineering (Chemical Engineering Dept.) Mary Kay O'Connor Process Safety Center, Texas A&M University, 2003
- M.S. Management and Safety Engineering, Ben Gurion University, Israel, 1998
- B.S. Mechanical Engineering, Ben Gurion University, Israel, 1990

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time

- 2011-Present: Associate Professor, ISU (full-time)
- 2005-2011: Assistant Professor, ISU (full-time)
- 2005-Present: Graduate Faculty, Human Computer Interaction, ISU
- 2004-2005: Assistant Research Scientist, Chemical Engineering, Texas A&M University (full-time)
- 2000-2003: Graduate Research Assistant, Chemical Engineering, Texas A&M University (part-time)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1999-2000: Rotem Amfert Group, Negev, Israel – maintenance manager sulfuric acid plant
- 1998-1999: Dead Sea Bromine Compounds Group, Ramat Hovav, Israel – maintenance manager fine chemical division
- 1990-1995: Nuclear Research Center, Negev, Israel – project manager and division safety engineer, maintenance manager, maintenance engineer
- 1982-1985: Israeli Navy, Israel

Current membership in professional organizations

- American Society of Safety Engineers
- Association of Technology, Management, and Applied Engineering
- Society for Judgment and Decision Making

Honors and awards

- ISU Miller Faculty Fellow (2007-08 & 2008-09)
- Magna Cum Laude, Ben Gurion University, Israel

Service activities (within and outside of the institution)

- Member of the Board of Directors of the Iowa Occupational Safety & Health Administration Advisory Council
- Associate Editor for the Journal of Technology Management and Applied Engineering
- Advisory Board Member for the University of Iowa's Industrial Hygiene Program
- ISU Faculty Senate
- ABE Technology Curriculum Committee
- ABE Facilities Safety Committee

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Zhang, W., Gkritza, K., Keren, N., & Nambisan, S. 2011. Age and gender differences in conviction and crash occurrence subsequent to being directed to Iowa's driver improvement program, *Journal of Safety Research*, 42(5): 317-414.
- Cena, L., Keren, N., Li, W., Carriquiry, A. L., Pawlovich, M. D., & Freeman S. A. 2011. A Bayesian assessment of the effect of highway bypasses in Iowa on crashes and crash rates, *Journal of Safety Research*, 42(4): 241-252.
- Keren, N., Freeman, S. A., Harmon, J. D., & Bern, C. J. 2011. Testing the effectiveness of an online safety module for engineering students. International Journal of Engineering Education, 27(2): 284-291.
- Keren, N. 2010. Incident database-based framework for establishing industrial safety performance assessments. Journal of Industrial Technology, 26(2):2-12.
- Samuel, C., Keren, N., Shelley, M. C., & Freeman, S. A. 2009. Frequency analysis of hazardous material transportation incidents as a function of distance from origin to incident location. Journal of Loss Prevention in the Process Industries. 22(6): 783-790.
- Keren, N., Mills, T. R., Freeman, S. A., & Shelley, M. C. 2009. Can level of safety climate predict level of orientation toward safety in a decision making task? Safety Science, 47(10): 1312-1323.
- Qiao, Y., Keren, N., & Mannan, M. S. 2009. Utilization of accident databases and fuzzy sets to estimate frequency of HazMat transport accidents. Journal of Hazardous Materials, 167 (1-3): 374-382.
- Mannan, M. S., O'Connor, T. M., & Keren, N. 2009. Patterns and trends in injuries due to chemicals based on OSHA occupational injury and illness statistics. Journal of Hazardous Materials, 163(1): 349-356.
- Henning, J. B., Stufft, C. J., Payne, S. C., Bergman, M. E., Mannan, M. S., & Keren, N. 2009. The influence of individual differences on organizational safety attitudes. Safety Science, 47(3): 337-345.

Briefly list the most recent professional development activities

- Road to Excellence, Iowa Governor's Occupational Safety & Health Conference, Cedar Rapids, IA 2011
- Rethinking the Future, Association of Technology, Management, and Applied Engineering Annual Conference, Cleveland, OH 2011
- Work, Stress, and Health Conference, Orlando, FL 2011

Jacek Koziel, Associate Professor

Education

- Ph.D. Civil Engineering, University of Texas at Austin, 1998
- M.S. Environmental Quality Engineering, University of Alaska Anchorage, 1993
- M.S.* Mechanical Engineering, Warsaw University of Technology, Poland, 1989 (*degree of 'Magister Inzynier' awarded after 5 year M.S. program. An 'Inzynier' degree (roughly B.S. equivalent) was awarded only in very rare circumstances for students declaring to terminate after completion of the 4rd year of studies)

Academic experience

- 2007-Present: Associate Professor, Department of Agricultural and Biosystems Engineering, Iowa State University (50% research, 50% teaching)
- 2004-2007: Assistant Professor, Department of Agricultural and Biosystems Engineering, Iowa State University (50% research, 50% teaching)
- 2000-2004: Assistant Professor, Texas Agricultural Experiment Station and Texas Agricultural Extension Service, Texas A&M University (75% research, 25% extension)
- 2001-2003: Adjunct Professor, West Texas A&M University (WTAMU) in Canyon, TX
- 1998-2000: Research Associate/Postdoctoral Fellow, New Analytical Methods and Technologies, Department of Chemistry, University of Waterloo, Canada

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- Alpha Epsilon Agricultural Engineers Society
- Air & Waste Management Association
- American Chemical Society
- International Society for Olfaction and Chemical Sensing

Honors and awards

- Featured on the "Stink" episode of *History Channel – Modern Marvels* production, air time – Jan 23, 2012.
- Outstanding Toxicology Faculty Mentor Award, Iowa State University (2011)
- Nomination for the 2011 Grand Prize Katerva Award ('Nobel Prize' for sustainability) for the "Hydrothermal liquefaction for sustainable oil spill remediation and partial recovery of oil product streams" white paper in response to the Gulf of Mexico 2010 oil spill (Rapp, Zhang, Wang, Sun, Minarick, Woolcock and Koziel) (2011)
- Multistate Research Award for Project S-1032
  - Improving the sustainability of livestock and poultry production in the United States (2011)
- The Best Paper Award – 1st World Conference PETrA (Pollution and Environment
  - Treatment of Air) 2011, for "Simultaneous Chemical and Sensory Analysis of Odor" by Koziel, Cai, Zhang, Hoff, Prague, Czech Republic (2011)
- Alpha Epsilon Agricultural Engineering Society, Honorary Member (2011)
- ISU College of Agriculture and Life Sciences Mid-Career Achievement in Research Award (2010)

Service activities (within and outside of the institution)

- ABE Scholarships Committee, chair
- ABE Awards and Honors Committee, vice-chair (not sure if I am – Matt Helmers is the chair)
- ABE Engineering Curriculum Committee, member
- ABE International programs, member
- College of Engineering, at-large senator and Caucus member
- College of Engineering Curriculum Committee, member

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Li, H., H. Xin, R. T. Burns, L. D. Jacobson, S. Noll, S. J. Hoff, J. D. Harmon, J. A. Koziel, B. Hetchler. 2011. Air emissions from tom and hen turkey houses in the U.S. Midwest. Transactions of ASABE, 54(1): 305-314.
- Rockafellow, E.M, J.A. Koziel, W.S. Jenks (2012). UV treatment of ammonia for livestock and poultry barn exhaust applications. Journal of Environmental Quality, 41, 281-288.
- Kenessov, B., Y. Sailaukhanuly, J.A. Koziel, L. Carlsen, M. Nauryzbayev. 2011. GC-MS and GC-NPD determination of formaldehyde dimethylhydrazone in water using SPME, *Chromatographia*, 73, 123-128.
- Akdeniz, N., J.A. Koziel, T.D. Glanville, H-K Ahn, B.P. Crawford. 2011. Air sampling methods for VOCs related to field-scale biosecure swine mortality composting. Bioresource Technology, 102: 3599-3602.
- Parker, D.B., Z. L. Perschbacher-Buser, N. A. Cole, M, J. A. **Koziel**. 2010. Recovery of agricultural odors and odorous compounds from polyvinyl fluoride film bags. *Sensors,* 10, 8536-8552**.**
- Akdeniz, N., J.A. **Koziel**, H-K Ahn, T.D. Glanville, B.P. Crawford. 2010. Field scale evaluation of volatile organic compound production inside biosecure swine mortality composts. *Waste Management*, 30, 1981-1988.
- Kenessov, B., J.A. **Koziel**, T. Grotenhuis, L. Carlsen. 2010. Screening of transformation products in soils contaminated with unsymmetrical dimethylhydrazine using headspace SPME and GC-MS. *Analytica Chimica Acta*, 674, 32-39.

Briefly list the most recent professional development activities (Invited presentations)

- Koziel, J.A., Rice, S. and D. Maurer. 2012. Simultaneous chemical and sensory analysis of odor and aromas with multidimensional GC. 29th International Symposium on Chromatography (ISC'2012) to be held in September 9-13, 2012 in Toruń, Poland.
- Koziel, J.A. 2011. Biosecurity and safety issues for beef cattle and dairy industry in US. First International Food Safety School. Al-Farabi Kazakh National University, Almaty, Kazakhstan, December, 2011.
- Koziel, J.A., L. Cai, S. Hoff, S. Zhang. 2011. Simultaneous chemical and sensory analysis of odor. Leibnitz Institute of Agricultural Engineering, Potsdam, Germany, August, 2011.

Steven Mickelson, Professor

Education

- Ph.D. Agricultural Engineering, Iowa State University, 1991
- M.S. Agricultural Engineering, Iowa State University, 1984
- B.S. Agricultural Engineering, Iowa State University, 1982

Academic experience

- 2011-Present: Department Chair, Agricultural and Biosystems Engineering (full-time)
- 2008-Present: Professor, Agricultural and Biosystems Engineering (full-time)
- 2008-2011: Director of the Center for Learning and Teaching (full-time)
- 1998-2008: Associate Professor, Agricultural and Biosystems Engineering (full-time)
- 1993-1998: Assistant Professor, Agricultural and Biosystems Engineering (full-time)
- 1984-1993: Assistant Professor, Freshman Engineering (part-time)
- 1982-1984: Adjunct Professor, Freshman Engineering (part-time)
- 1982-1991: Graduate Assistant, Iowa State University (part-time)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1984: Sundstrand, Systems Engineer (full-time)
- 1979: Buena Vista County, Summer engineering intern

Certifications or professional registrations

- 1984 Engineering-in-Training

Current membership in professional organizations

- International Society for the Scholarship of Teaching and Learning
- American Society of Agricultural and Biological Engineers
- American Society of Engineering Educators
- Gamma Sigma Delta
- Alpha Epsilon Honors Society

Honors and awards

- ISU ABE Chair's Faculty Citation Award (2009)
- ISU Learning Community Scholarship Award (2008)
- Sesquicentennial Hubbard Award Finalist for Teaching Excellence (2007)
- ISU Membership to the 25 Year Club (2007)
- ISU Scholarship Award for Exemplary Contributions to ISU Learning Communities(2007)

Service activities (within and outside of the institution)

American Society of Agricultural and Biological Engineers

- Chair, SW-22 Erosion Control Group 2009
- Secretary, SW-22 Erosion Control Group 2008

- Program Chair, SW-225 Conservation Systems 2007
- Chair, SW-225 Committee 2007
- Program Chair, SW-225 Conservation Systems 2006

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Webber, D.F., S.K. Mickelson, B.D. Whitman, T.L. Richard, and H.K. Ahn. 2011 Livestock manure windrow composting runoff and infiltration characteristics from laboratory rainfall simulations. Compost Science and Utilization (Accepted for publication on 3-8-2010)
- Eide, A, R. Jenison, S. Mickelson, and L. Northup. *Engineering Fundamentals and Problem Solving*. 6th Edition. 2011.
- Webber, D.F., S.K. Mickelson, L.W. Wulf, T.L. Richard, and H.K. Ahn. 2010. Hydrologic modeling of runoff from a livestock windrow composting site and vegetative filter strip buffers. Journal of Soil and Water Conservation 65(4):252-260.
- Arora, K., S.K. Mickelson, M. Helmers, and J.L. Baker. 2010. Review of Pesticide Retention Processes Occurring in Buffer Strips Receiving Agricultural Runoff. Journal of the American Water Resources Association 46(3):618-647.
- Webber, D.F., S.K. Mickelson, S.I. Ahmed, J.R. Russell, W.J. Powers, R.C. Schultz, and J.L. Kovar. 2010. Livestock grazing and vegetative filter strip buffer effects on runoff sediment, nitrate, and phosphorus losses. Journal of Soil and Water Conservation 65(1):34-41.
- Saunders, K., T. Brumm, C. Brook, S. Mickelson, and S. Freeman. 2009. Assessing student work to support curriculum development: An engineering case study. Journal of Learning Communities Research 3(3): 47-62.
- Pappas, E.A., Kanwar, R.S., Baker, J.L., Lorimor, J.C., Mickelson, S. 2008. Fecal indicator bacteria in subsurface drain water following swine manure application. *Transactions of the ASABE* 51(5):1567-1573.

Briefly list the most recent professional development activities

- ASABE Department Heads (ED-210) Meeting, New Orleans, LA, February 1-3
- ATMAE Annual Conference, Cleveland, OH, November 9-12, 2011
- ASABE International Conference, Louisville, KY, August 7-10, 2011
- NSF-STEP Grantees Conference, Washington DC, March 17-18, 2011
- New Jersey Institute of Technology Learning Community Conference, March 29-31, 2011
- ISU Student Success Summit in Ames, IA, March 24-25, 2011
- Professional and Organizational Development Conference, St. Louis, MO, Nov. 4-6, 2010
- NSF-STEP Grantees Conference, Washington D.C., March 2-6, 2010
- Collaboration Conference, Minneapolis, MN, February 19-20, 2010
- Difficult Dialogue Faculty Forum, Ames, IA, February 8, 2010
- NSF-STEP Grantees Conference, Washington D.C., March 11-13, 2009
- ISSOTL Conference, Edmonton, Alberta, Canada, October 15-18, 2008
- ASABE International Conference, Providence, RI, June 29-July 2, 2008

Manjit Misra, Professor

Education

- Ph.D. Agricultural Engineering, University of Missouri, Columbia, 1978
- M.S. Agricultural Engineering, University of Missouri, Columbia, 1973
- B.S. Agricultural Engineering, Orissa University of Agricultural Technology, Orissa, India, 1971

Academic experience

Iowa State University

- 2008-Present: Dean's Chair for Distinction, College of Agriculture and Life Sciences
- 2005-2008: Director, Institute for Food Safety and Security
- 2002-Present: Founding Director, Biosafety Institute for Genetically Modified Agricultural Products (BIGMAP)
- 1991-Present: Director, Seed Science Center (full-time)
- 1991-present: Professor, Agricultural and Biosystems Engineering
- 1984-1991: Associate Professor, Agricultural and Biosystems Engineering
- 1979-1984: Assistant Professor, Agricultural and Biosystems Engineering

University of Missouri

- 1978-1979: Research Associate (full-time)
- 1971-1978: Graduate Research Assistant (part-time)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time: none

Certifications or professional registrations: none

Current membership in professional organizations

- American Society of Agricultural Engineers
- American Seed Trade Association
- African Seed Trade Association
- Iowa Seed Association
- Alliance to End World Hunger

Honors and awards

- Chair, National Genetic Resources Advisory Council, USDA, (2012-14)
- Appreciation Plaque from the American Seed Trade Association for chairing the planning committee of Corn and Sorghum seed research conference, 2011
- Order of the Knoll Distinguished Faculty and Staff Award, Iowa State University 2008
- Honorary Member, Iowa Seed Association, 2007
- Global Round Table Discussion for Farmers on "Networking on Biotechnology", The World Food Prize International Symposium, moderator, 2007

Service activities (within and outside of the institution)

- Founding Board member, First the Seed Foundation

- Member, Steering Committee, Food and Agriculture Organization (FAO) International Biotechnology Conference, 2009-10
- Editorial Board, Seed World (2002-present)
- Proposal reviewer for Plant Science Institute Grants Program (2000-present)
- Board of Directors, Iowa Seed Association (1991-present)
- Board of Directors, Iowa Crop Improvement Association (1993-present)
- Chair, Education committee, First the Seed Foundation, American Seed Trade Association, 2011-12

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Okeno, J.A., E. Mutegi, S. de Villiers, J. D. Wolt, and M. K. Misra. 2012. Morphological Variation in the Wild-Weedy Complex of Sorghum Bicolor in Situ in Western Kenya: Preliminary Evidence of Crop-to-Wild Gene Flow. *Int. J. Plant Sci*. 173(5):1-10.
- Iakovoglou, V., M. K. Misra, R. B. Hall, and A. D. Knapp. 2010. Alterations of Seed Variables Under Storage in Nitrous Oxide (N2O) Atmospheres for Two Recalcitrant Quercus Species. *Scandinavian Journal of Forest Research*, 25(1): 24-30.
- Iakovoglou, V., M. K. Misra, R. B. Hall, and A. D. Knapp. 2009. How Seed Size and Desiccation Time Affect Seed Deterioration of Quercus macrocarpa L. *Seed Technology*. 31(1) 21-39.
- Krueger, N. A., C. J. Bern, M. K. Misra, K. M. Adam. 2007. Gravity Table Sorting of Commodity Corn. *Applied Engineering in Agriculture*, 23(3), 319-325.
- Iakovoglou, V., M. K. Misra, R. B. Hall, and A. D. Knapp. 2007. The Effect of Seed Size and Parent Tree on Seed Variables and Seedling Growth of Quercus spp. *Seed Science and Technology*, Vol. 35:771-777.
- Wolt, J.D., Y-Y. Shyy, P. Christensen, K.S. Dormin, and M. Misra. 2005. Quantitative Exposure Assessment for Confinement of Maize Biogenic Systems. *Environmental Biosafety Research*, 3:183-196. Also at http://www.edpsciences.org/10.1051/ebr:2005004.
- Adam K, M. Misra, and D. Thoreson. 2004. Removal of Ergot from Barley by Density Separation. *Applied Engineering in Agriculture*, 20(1):39-43.
- "Quality Seeds to Feed the World", invited presentation to the USAID (2011), to Department of State (2011), to the International Food Policy Research Institute (2010) and to the Alliance for Green revolution in Africa, 2009.

Briefly list the most recent professional development activities

- Corn and Sorghum Seed Research Conference, American Seed Trade Association, 2011, 2010, 2009, 2008, 2007
- Soybean seed Research conference, American Seed Trade Association, 2011, 2010, 2009, 2008, 2007
- USAID-USDA Food security Conference, 2011
- USDA Outlook Conference, 2011
- Food and Agriculture Organization (FAO) International Biotechnology Conference, Mexico, 2009-10

D. Raj Raman, Professor

Education

- Ph.D. Biological Engineering, Cornell University, 1994
- B.S. Electrical Engineering, Rochester Institute of Technology, 1986

Academic Experience

Iowa State University

- 2011-Present: Associate Chair for Teaching, Agricultural & Biosystems Engineering
- 2011-Present: Professor, Agricultural & Biosystems Engineering
- 2011-Present: Pyrone Testbed Champion, CBiRC[11]
- 2008-Present: University Education Program Director, CBiRC
- 2006-2011: Associate Professor, Agricultural & Biosystems Engineering
- 2006-2011: Associate Director of Educational Programs, Bioeconomy Institute

The University of Tennessee

- 2004-2005: Interim Head and Associate Professor, BEES[12]
- 2000-2003: Faculty Member, Engage Freshman Engineering Program
- 1999-2005: Associate Professor, BEES
- 1993-1999: Assistant Professor, Agricultural & Biosystems Engineering

Cornell University

- Spring 1993: Instructor, Biomass Conversion Processes for Energy and Chemicals
- Fall 1989: Teaching Assistant, Sensory Function (BIO S 492)

Non-academic Experience

- Spring 1988: Research Support Specialist, Cornell University Departments of Agricultural and Biological Engineering and Neurobiology and Behavior (FT)
- Fall 1987: Substitute Teacher, Rush-Henrietta School District, Henrietta, NY (FT)
- 1985-1986: Physics and Math Tutor, National Technical Institute for the Deaf (PT)
- Spring 1985: Co-op Engineer, Digital Equipment Corp., Burlington, VT (6 mo. FT)
- Spring 1984: Co-op Engineer, Hewlett-Packard Corp., Albany, NY (6 mo., FT)
- Summer 1983: Co-op Engineer, Sykes Datatronics, Rochester, NY (3 mo., FT)
- 1982: Consultant, Duostat Corporation, Hackettstown, NJ. (part-time)

Certifications or Professional Registrations

- Professional Engineer, Tennessee License No. 104996, Active

Current Membership in Professional Organizations

- ASABE Member
- Sigma Xi Member
- ASEE Member

[11] NSF Engineering Research Center for Biorenewable Chemicals

[12] Biosystems Engineering and Environmental Science Department (now Biosystems Engineering & Soil Science)

Honors and Awards

- Honorable Mention Paper Award. For peer reviewed paper entitled *Evaluation of ultrasonic pretreatment on anaerobic digestion of different animal manures*. Shared with Wu-Haan W., R. T. Burns, L. B. Moody, and D. Grewell. American Society of Agricultural and Biological Engineers. (2011)
- Honorable Mention Paper Award. For peer reviewed paper entitled *Design and Testing of a Pilot-Scale Aqueous Ammonia Soaking Biomass Pretreatment System*. Shared with Himmelsbach, J. N., A. Isci, and R. P. Anex. American Society of Agricultural and Biological Engineers. (2010)
- Recognized for educational contributions to Iowa State University Agricultural Engineering student recipients of the Provost's Student Scholars and Leaders Recognition Award. (Daniel Murray) (2008)

Service Activities (within and outside of the institution)

- Chair, ABE Engineering Curriculum Committee
- Director of Graduate Education, Biorenewable Chemicals
- Director University Educational Programs, CBiRC
- Member, College of Engineering Dean's Budget and Planning Advisory Committee
- Member, Graduate Minority Assistantship Program Council

Most Important Recent Publications

- Raman, D. R. and R. P. Anex. 2012. Conceptual and mathematical models of batch simultaneous saccharification and fermentation: dimensionless groups for predicting process dynamics. *Journal of Biological Systems. (In Press)*
- Faulhaber, C. R., D. R. Raman, and R. T. Burns. 2012. An engineering-economic model for analyzing dairy plug-flow anaerobic digesters: cost structures and policy implications. *Transactions of the American Society of Agricultural and Biological Engineers* 55(1): 201 – 209
- Deutmeyer, A, D. R. Raman, P. T. Murphy, and S. Pandey. 2011. Effect of magnetic field on the fermentation kinetics of *Saccharomyces cerevisiae*. *Advances in Bioscience and Biotechnology* 2: 207 – 213
- Murphy, P. T., K. J. Moore, D. R. Raman, R.P. Anex, and S. L. Fales. 2011. Rapid biomass quality determination of corn stover using near infrared reflectance spectroscopy. *BioEnergy Research* 5(1): 79 – 85
- Rawat, V., D. R. Raman, and R. P. Anex. 2011. Technical Note: Detecting and Subcategorizing Hard-Coding Errors in Bioenergy-Relevant Spreadsheets using Visual Basic for Applications (VBA). *Applied Engineering in Agriculture* 27(3), 469 – 474

Recent Professional Development Activities

- NSF EEC Meeting, March 2012 (Attended)
- NSF ERC Meeting, December 2011 (Attended, led session for education directors)
- CBiRC Working Meeting, October 2011 (Attended, presented pyrone testbed TEA)
- ASABE Annual International Meeting, August 2011 (Attended with 9 REU students, assisted with PE writing, attended technical sessions)

Kurt Rosentrater, Assistant Professor

Education

- Ph.D. Agricultural Engineering, Iowa State University, 2001
- M.S. Agricultural Engineering, Iowa State University, 1996
- B.S. Agricultural Engineering, Iowa State University, 1994

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time

- 2011-Present: Assistant Professor, Agricultural and Biosystems Engineering
- 2005-Present: Adjunct Assistant Professor, Graduate Faculty, South Dakota State University, Department of Nutrition, Food Science, and Hospitality
- 2004-Present: Adjunct Assistant Professor, Graduate Faculty, South Dakota State University, Department of Agricultural and Biosystems Engineer
- 2002-2004: Assistant Professor, Northern Illinois University, Dept. of Engineering and Industrial Technology

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 2004-2011: USDA, Agricultural Research Service, Brookings, SD, Bioprocess Engineer, Lead Scientist, NCARL Management Team, NCARL Research Leader
- 1997-2002: Todd & Sargent, Inc., Design Development Department, Process Development Engineer

Certifications or professional registrations

Current membership in professional organizations

- American Association of Cereal Chemists
- American Design Drafting Association
- American Society of Agricultural and Biological Engineers
- American Society for Engineering Education
- American Society for Quality

Honors and awards

- USDA-ARS Award of Excellence, Northern Plains Area Diversity Taskforce (2011)
- USDA-ARS Award of Excellence, Research Leader (2011)
- Institute of Food Technologists Outstanding Section Volunteer (2009)
- USDA-ARS Certificates of Merit/Superior Performance (2004-2010)
- ASABE Manuscript Reviewer of the Year (2006)

Service activities (within and outside of the institution)

- USDA-ARS Northern Plains Area Diversity Task Force
- USDA-ARS Research Position Evaluation Committee Panel
- USDA-ARS Mechanical Measurements Patent Committee
- ABE Computer Education Committee

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Bhadra, R., K. A. Rosentrater, and K. Muthukumarappan. 2011. Effects of CDS and drying temperature levels on the flowability behavior of DDGS. Drying Technology (accepted, in press).
- Bhadra, R., K. A. Rosentrater, and K. Muthukumarappan 2010. Effects of varying CDS levels and drying and cooling temperatures on flowability properties of DDGS. Cereal Chemistry (in review).
- Bhadra, R., K. Muthukumarappan, and K. A. Rosentrater. 2011. Measurement of sticky point temperature of coffee powder with a rheometer. International Journal of Food Properties (accepted, in press).
- Antunez, P. D., M. B. Omary, K. A. Rosentrater, M. Pascall, and L. Winstone. 2011. Effect of an oxygen scavenger on the stability of preservative free flour tortillas. Journal of Food Science (accepted, in press). DOI: 10.1111/j.1750-3841.2011.02470.x. Published online 02 Dec. 2011.
- Ayadi, F., K. Muthukumarappan, K. A. Rosentrater, and M. L. Brown. 2011. Single screw extrusion processing of distillers dried grains with solubles (DDGS)-based yellow perch (Perca flavenscens) feeds. Cereal Chemistry 88(2): 179-188.
- Ayadi, F., K. A. Rosentrater, K. Muthukumarappan, and M. L. Brown. 2011. Twin screw extrusion processing of rainbow trout (Oncorhynchus mykiss) feeds using various levels of distillers dried grains with solubles (DDGS). Cereal Chemistry 88(4): 363-374.
- Bhadra, R., K. A. Rosentrater, K. Muthukumarappan, and S. Kannadhason. 2011. Drying characteristics of distillers wet grains under varying condensed distillers solubles and drying temperature levels. Applied Engineering in Agriculture 27(5): 777-786.
- Bhadra, R., K. Muthukumarappan, K. A. Rosentrater, and S. Kannadhason. 2011. Drying kinetics of distillers wet grains (DWG) under varying condensed distillers solubles (CDS) and temperature levels. Cereal Chemistry 88(5): 451-458.
- Bhadra, R., K. Muthukumarappan, and K. A. Rosentrater. 2011. Artificial neural network modeling of distillers dried grains with solubles (DDGS) flowability with varying process and storage parameters. Cereal Chemistry 88(5): 480-489.
- Mjoun, K. and K. A. Rosentrater. 2011. Extruded aquafeeds containing distillers dried grains with solubles: effects on extrudate properties and processing behaviour. Journal of the Science of Food and Agriculture 91(15): 2865–2874.

Briefly list the most recent professional development activities

- AbilityOne Program Training, Ag Learn, Brookings, SD 2010
- Extramural Agreements Maintenance Training for ADODRs, Ag Learn, Brookings, SD 2010
- USDA-ARS Bioenergy Conversion Technology Transfer Workshop, New Orleans, LA 2008
- NOAA-USDA Alternative Aquaculture Feeds Initiative, Seattle, WA 2008
- CSREES/NC 50 Sustainable Biorefining Systems for Corn Ethanol in North Central Region

Charles Schwab, Professor

Education

- Ph.D. Agricultural Engineering, University of Kentucky, 1989
- M.S. Agricultural Engineering, University of Kentucky, 1982
- B.S. Agricultural Engineering, University of Kentucky, 1979

Academic experience

- 2005-Present: Professor, Extension Safety Specialist, Iowa State University
- 1995-2005: Associate Professor, Extension Safety Specialist, Iowa State University
- 1990-1995: Assistant Professor, Extension Safety Specialist, Iowa State University
- 1989-1990: Postdoctoral Scholar, Research/Teaching, University of Kentucky
- 1982-1988: Research Specialist, University of Kentucky
- 1979-1982: Research Associate, University of Kentucky

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

Certifications or professional registrations

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- Sigma Xi
- Iowa Farm Safety Council
- American Society for Engineering Education
- International Society of Agricultural Safety and Health
- Association of Technology, Management, and Applied Engineering
- International Technology and Engineering Educators Association

Honors and awards

- Academic Excellence in Universities, Association of Technology, Management, and Applied Engineering (2010)
- Blue Ribbon for ASABE Educational Aids Competition (2010)
- ISU Outstanding Achievement in Extension or Professional Practice (2010)
- Laureate Member of Epsilon Pi Tau (2010)
- NAMIC Engineering Safety Award (2009)

Service activities (within and outside of the institution)

- Advisor and Trustee for Epsilon Pi Tau
- Occupational Safety Focus Group Leader
- ABE Technology Curriculum Committee Chair
- College of Agriculture and Life Sciences Strategic Planning Committee
- ISU Faculty Recognition and Development Committee
- Faculty Senate Representatives to the Athletic Council

- Iowa State University's Ingestion Pathway Plan for nuclear power plant radiological emergency response program

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Burgus, S., C.V. Schwab, M. Shelly. 2011. Assessing Rural Coalitions That Address Safety and Health Issues. Journal of Extension (Accepted/in-press).
- Gillette, J.C., C. A. Stevermer, R. H. Miller, W. B. Edwards, and C. V. Schwab. 2011. Lower extremity joint moments during carrying tasks in Children. Journal of Applied Biomechanics. (Accepted/in press)
- Schwab, C. V., and S. A. Freeman. 2011. Pilot Evaluation of an Internet Educational Module for Agricultural Safety. Journal of Extension 49(3).
- Gillette, J. C., C.A. Stevermer, R.H. Miller, S.A. Meardon, and C.V. Schwab. 2010 The effects of age and type of carrying task on lower extremity kinematics. Ergonomics 53: 3, 355 — 364.
- Coffman, C. W., J. F. Stone, A. C. Slocum, A.J. Landers, C. V. Schwab, L. G. Olsen, and S. Lee. 2009. Use of Engineering Controls and Personal Protective Equipment by Certified Pesticide Applicators. ASAE Journal Agricultural Safety and Health 15(4):311-326.
- Freeman, S.A., D. W. Field, C. W. Lott, and C.V. Schwab, 2009. Evaluation of the Safety Content in the National Association of Industrial Technology Certification Exam. Journal of Industrial Technology 25(1):8 pages.
- J. C. Gillette, C. A. Stevermer, S. A. Meardon, T R. Derrick, and C. V. Schwab. 2009. Upper Extremity and Lower Back Torques During Carrying Tasks in Farm Children. Journal of Applied Biomechanics. 25, 149-155.
- Freeman, S.A., C.V. Schwab, Q. Jiang. 2008. Quantifying Stressors Among Iowa Farmers. ASAE Journal Agricultural Safety and Health 14(4):431-439.

Briefly list the most recent professional development activities

- ATMAE Annual Conference 2011
- Understanding Proposed Changes to Child Labor Regulations, AgriSafe Webinar 2011
- State of Iowa Radiological Emergency Preparedness Annual Training 2011
- NCERA 197 Agricultural Safety and Health Research and Extension annual meeting 2011
- International Technology and Engineering Educators Association annual conference 2011

James Shahan, Adjunct Assistant Professor (Full Time ABE)

Education

- M.S. Agricultural Engineering, Iowa State University, 1985
- B.S. Agricultural Engineering, Iowa State University, 1979

Academic experience

- 1990-present: Adjunct Assistant Professor, Iowa State University
- 1980-1990: Temporary Instructor, Graduate Research Assistant, Computer Programmer, Iowa State University

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1979: Farm Automation Sales/Manager, Mahaska Farm Services, Oskaloosa

Certifications or professional registrations

- Autodesk Inventor 2012 Certified Professional
- AutoCAD 2012 Certified Professional
- Autodesk Certified Instructor
- Professional Engineer – Agricultural Engineering, Iowa, 1986
- EIT Certification, USA, 1979

Current membership in professional organizations

- American Society of Engineering Education
- Alpha Epsilon

Honors and awards

- ISU 25 year club (2010)
- Order of the Engineer (1986)

Service activities (within and outside of the institution)

- ATMAE Certified Graphics Specialist Exam Reviewer
- Review board for the Engineering Design Graphics Journal

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

Briefly list the most recent professional development activities

- Autodesk University, Las Vegas, NV 2011
- Autodesk Manufacturing Education Focus Group, San Francisco, CA 2011
- SolidWorks World, San Antonio, TX 2011

Lloyd D. Snell, Lecturer

Education

- PhD candidate - ABD Nov. 2009, Agricultural Engineering, Iowa State University
- Master of Science, Agricultural Engineering, Iowa State University, 2008
- Bachelor of Science, Mechanical Engineering, Iowa State University, 2000
- Bachelor of Art, Theology, McPherson College, 1983

Academic experience

- 2008 – Present: Lecturer, Agricultural and Biosystems Engineering, ISU

Non-academic experience

- 2002-2008 - Sauer Danfoss Inc., Manufacturing Engineer, Ames, IA 50010
- 2001-2002 - Wandling Snell, Inc., Principle/Design Engineer, Ames, IA 50010
- 2000-2001 - Wandling Engineering, Engineering Intern, Ames, IA 50010
- 1988-1996 - LTS Machine Inc. / Paecific Applied Multiple Applications Inc., Principle/Machine Shop and Manufacturing, Hughson, CA 95326
- 1985-1988 - FGL Inc., Principle/Mechanic, McFarland, CA 93250
- 1983-1985 - 81 Farm Supply, Mechanic, McPherson, KS 67460
- 1978-1981 - McPherson College, Maintenance Department, McPherson, KS 67460
- 1974-1979 - Dale Snell Farms, Farm Labor, McFarland, CA 93250

Certifications or professional registrations

- FE, 2001

Current membership in professional organizations

- ASABE

Honors and awards

- ASABE Faculty of the Year Award, 2009

Most important publications and presentations from the past five years

- Force and Moment Analysis of Stacked Counter Rotating Eccentric Mass Tree Shaker Energy-Wheel System, Iowa State University, MAI 47/01, Feb 2009, Publication Number 1454712, Snell, Lloyd Dale.
- US Patent Pending (Feb. 2011) – Trade-in Vehicle Value Optimizing Systems and Methods for Sellers, Buyers, and Dealerships
- US Patent Pending (Aug. 2010) – Systems and Methods for Harvesting Nut- and Fruit-Trees.
- US Patent (6,152,435)–CNC Vise Jaws for Clamping Multiple Diameters Cylindrical Parts in Standard Linear CNC Vises.

Briefly list the most recent professional development activities

- None reported

Michelle Soupir, Assistant Professor

Education

- Ph.D. Biological Systems Engineering, Virginia Tech, 2008
- M.S. Biological Systems Engineering, Virginia Tech, 2003
- B.S. Biological and Agricultural Engineering, Kansas State University, 1999

Academic experience

- 2008-Present: Assistant Professor, Agricultural and Biosystems Engineering, Iowa State University.
- 2001-2008: Graduate Research Assistant, Biological Systems Engineering, Virginia Tech.

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 2000-2001: Environmental Engineer, Camp Dresser and McKee, IN

Certifications or professional registrations

- EIT Certification, April 1999
- OSHA 40-hour HAZWOPPER Certification

Current membership in professional organizations

- Alpha Epsilon
- American Water Resources Association, member
- American Society for Engineering Education, member
- Soil and Water Conservation Society, member
- American Society of Agricultural and Biological Engineers, member

Honors and awards

- Black and Veatch "Building a World of Difference" Faculty Fellow (2011)
- PEO Scholar Award (2007)
- EPA Science to Achieve Results (STAR) Graduate Fellowship (2006)
- USDA National Need Doctoral Fellowship (2003)
- ASABE Student Engineer of the Year (1999)

Service activities (within and outside of the institution)

- Associate Editor, *Journal of Environmental Quality* (2012-2014)
- Nonpoint Source Management Planning Committee, ISU representative, an effort led by the Iowa DNR to develop a state-wide plan with input from a wide range of groups.
- ABE Awards Committee
- ABE Social Committee
- ABE Graduate Programs Committee
- Faculty Advisor for Environmental Science Graduate Association

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Pandey, P.K., M.L. Soupir, and C.R. Rehmann. 2012. A model to predict resuspension of E. coli from streambed sediments. *Water Research*. 46: 115-126. DOI:10.1016/j.watres.2011.10.019
- Liu, P., M.L. Soupir, M.R. Zwonitzer, B. Huss, L.R. Jarobe. 2011. Antibiotic resistance in agricultural E. coli isolates correlates with attachment to quartz. *Applied and Environmental Microbiology*. 77(19): 6945-6953. DOI: 10.1128/AEM.00717-11.
- Soupir, M.L. and S. Mostaghimi. 2011. E. coli and enterococci attachment to particles in runoff from high and low vegetative cover grassland. *Water, Air and Soil Pollution*. 216:
- 167-178. DOI:10.1007/s11270-010-0524-8.
- Pandey, P.K., M.L. Soupir, V.P. Singh, and S.N. Panda. 2011. Modeling rainwater storage in distributed reservoir systems in humid subtropical and tropical savannah regions. *Water Resources Management*. 25(13): 3091- 3111. DOI:10.1007/s11269-011-9847-5
- Pandey, P.K. and M.L. Soupir. 2011. E. coli inactivation kinetics in anaerobic digestion of solid dairy manure under low, mesophilic and thermophilic temperatures. *AMB Express*. DOI:10.1186/2191-0855-1-18
- Soupir, M.L., S. Mostaghimi, and T. Dillaha. 2010. Attachment of Escherichia coli and enterococci to particles in runoff from bare soils. *Journal of Environmental Quality*, 39(3):1019-1027. DOI:10.2134/jeq2009.0296.

Briefly list the most recent professional development activities

- Annual International Meeting of the American Society of Agricultural Engineers, Louisville, KY, August 7 - 10, 2011
    - Moderated Monitoring and Modeling the Fate and Transport of Pathogens session
- Environmental Protection Agency Region 7 2010 Impaired Waters and Watersheds Conference in Kansas City, MO, May 10 – 12, 2010.
- Annual International Meeting of the American Society of Agricultural Engineers, Pittsburg, PA, June 20 – 23, 2010
    - Moderated Monitoring and Modeling the Fate and Transport of Pathogens session
    - Moderated Applications of Hydrologic and Biological Process Models session
- ISU CELT Teaching Partners Program, 2009 - 2010
- Morrison Workshop, Iowa State University, Ames, IA, March 8-9, 2010
- ASABE 21st Century Watershed Technology: Improving Water Quality and Environment. San Jose, Costa Rica, 2/21/10 – 2/24/10.

Brian Steward, Professor

Education

- Ph.D. Agricultural Engineering, University of Illinois, Urbana, 1999
- M.S. Electrical Engineering, South Dakota State University, 1994
- B.S. Electrical Engineering, South Dakota State University, 1989

Academic experience

- 2012: Professor (60% teaching, 30% Research, 10% Service Appointment), Iowa State University
- 2005-2012: Associate Professor (60% teaching, 30% Research, 10% Service Appointment), Iowa State University
- 2009-2010: Fulbright Visiting Professor, Departamento de Engenharia Agricola, Universidade Federal de Viçosa, Minas Gerias, Brasil
- 1999-2005: Assistant Professor (50% teaching, 50% research appointment), Iowa State University
- 2003-present: Human Computer Interaction Graduate Program Faculty, Iowa State University
- 2000-present: Graduate Program in Sustainable Agriculture Faculty, Iowa State University

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 10/89 – 7/94: Design Engineer, Raven Industries, Sioux Falls, SD
- 5/89 – 8/89: Intern, Missouri Basin Municipal Power Agency, Sioux Falls, SD

Certifications or professional registrations

- Licensed as Professional Engineer in Iowa (2008; Lic. #18674)

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers, member
- Alpha Epsilon, Honor Society of Agricultural, Food, and Biological Engineering, member
- Eta Kappa Nu, National Electrical and Computer Engineering Honor Society, member
- Phi Kappa Phi Honor Society, member
- Tau Beta Pi, Engineering Honor Society, member

Honors and awards

- ASABE Honorable Mention Paper Award for Transactions of the ASABE journal article (2011).
- ISU College of Agricultural and Life Sciences Outstanding Achievement in International Agriculture Award, Presented at the CALS Spring University Convocation (2011)
- ISU Louis Thompson Distinguished Undergraduate Teacher Award, Presented at the ISU Fall University Convocation (2010)
- Fulbright Scholarship Grant for Research and Lecturing at the Universidade Federal de

Viçosa, Viçosa, Minas Gerais, Brasil (2009)
- ISU College of Engineering Superior Engineering Teacher Award, Presented at the ISU College of Engr. Fall Convocation (2008)

Service activities (within and outside of the institution)
- American Society of Agricultural and Biological Engineers: IET-04 – Information and Electrical Technologies Division Publication Review and Paper Award Committee (2005-present); IET-217 – Computational Methods, Simulations, and Applications (2011-present); IET-254 – Emerging Information Systems (2001-present); IET-312 – Machine Vision (1998-present); IET-318 – Mechatronics and Biorobotics (2000-present)
- Coordinator of ISU-UFV (Brazil) Exchange Program (2008-present)
- ABE Space Committee (2011-present)
- ABE International Programs Committee, Chair (2010-present)
- College of Engineering International Programs Advisory Committee (2010-present)
- Associate Editor, Transactions of ASABE, Applied Engineering in Agriculture (2005-present)

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
- Aziz, S. A., B. L. Steward. A. L. Kaleita, and M. Karkee. 2012. Assessing the effects of DEM error uncertainty on soil loss estimation in agricultural fields. Transactions of the ASABE.
- Karkee, M., R. P. McNaull, S. J. Birrell, and B.L. Steward. 2012. Agricultural Biomass Removal Rate Estimation for Real-time Optimization of Single Pass Crop Grain and Biomass Harvesting System. Transactions of the ASABE 55(1): 107-115.
- Karkee, M. and B. L. Steward. 2011. Parameter estimation and validation of a tractor and single axle towed implement dynamic system model. Computers and Electronics in Agriculture 77(2): 135-146.
- Bhandari, A., S. K. Ong, and B. L. Steward. 2011. Student learning in a multidisciplinary sustainable engineering course. Journal of Professional Issues in Engineering Education and Practice. 137(2):86-93.

Briefly list the most recent professional development activities
- Sauer-Danfoss Plus+1 Developer Training, Ames, IA 12/19-22/2011
- HYSAN Version 9 Training, Ames, IA 9/1/2011
- National Fluid Power Association Industry and Economic Outlook Conference, Schaumburg, IL
- Annual International Meeting of the American Society of Agricultural and Biological Engineers, Louisville, KY
- FIPSE/CAPES Directors Meeting, Florianópolis, SC, Brazil
- ISU Faculty Professional Development Assignment as a Fulbright Visiting Professor in Departamento de Engenharia Agrícola, Universidade Federal de Viçosa, Viçosa, Brazil

Lie Tang, Associate Professor

Education

- Ph.D. Agricultural Engineering, University of Illinois at Urbana-Champaign, 2002
- M.S. Agricultural Engineering, Zhejiang University, China, 1994
- B.S. Electrical Engineering, Jiangsu University of Science and Technology, China, 1989

Academic experience

- 8/10 – present Associate Professor, Department of Agricultural & Biosystems Engineering, Iowa State University
- 10/04 – 7/10 Assistant Professor, Department of Agricultural & Biosystems Engineering, Iowa State University
- 8/08 – present Human Computer Interaction Graduate Program Faculty, Iowa State University, Ames, IA
- 7/03 – 9/04 Assistant Professor, Department of Agrotechnology and Food Sciences, Wageningen University, The Netherlands
- 3/02 – 7/03 Assistant Professor, AgroTechnology, Department of Agricultural Sciences, the Royal Veterinary and Agricultural University (KVL), Denmark

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 7/1995-10/1995: Hangzhou Kaiton Automatic Control Co., Hangzhou, China, Software Development Consultant
- 9/1989-7/1991: Hangzhou Switchgear Factory, Hangzhou, China, Design Engineer

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- Epsilon Pi Tau

Honors and awards

- Adjunct Professor, Jiangsu University, 2011~
- Adjunct Scientist, National Engineering Research Center for Information Technology in Agriculture, 2011~
- Newcomer Engineer of the Year, Iowa Section of ASABE (2009)

Service activities (within and outside of the institution)

- Associate Editor, IET Division, Transactions of the ASABE (2008-present)
- Associate Editor, Power and Machinery Division, International Journal of Agricultural and Biological Engineering (IJABE) (2008-present)
- Chair, ASABE IET Division (2012)
- IEEE Robotics and Automation's Technical Committee on Agricultural Robotics (200-present)
- Program co-chair of the Agricultural Machinery Conference (2006)
- ASABE IET-312 – Machine Vision Committee (secretary, 2008; vice chair, 2009, Chair, 2010)

- ASABE IET-318 – Mechatronics and Biorobotics Committee (secretary, 2007; vice chair, 2008; chair, 2009, 2010
- ASABE PM-54 – Precision Agriculture Committee (2006-present)

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

*MS, Ph.D., Post Doc, or Research Scientist supervised by Tang

- Nakarmi, A.* and L. Tang. 2012. Automatic Inter-plant spacing sensing at early growth stages using a 3D vision sensor. Computers and Electronics in Agriculture 82(3): 23-31.
- Jin, J.*, L. Tang. 2011. Coverage path planning on three-dimensional terrain for arable farming. Journal of Field Robotics 28(3):424-440.
- Tu, X.*, S. Du, L. Tang, H. Xin, B. Wood. 2011. A real-time automated system for monitoring individual feed intake and body weight of group housed turkeys. Computers and Electronics in Agriculture 75(2): 313-320.
- Jin, J.* and L. Tang. 2010. Optimal coverage path planning for arable farming on 2D surfaces. Transactions of the ASABE 53(1): 283-295.
- Jin, J.* and L. Tang, Z. Hruska, H. Yao. 2009. Classification of toxigenic and atoxigenic strains of Aspergillus Flavus with hyperspectral imaging. Computers and Electronics in Agriculture 69: 158-164.
- Jin, J.* and L. Tang. 2009. Corn plant sensing using real-time stereo vision. Journal of Field Robotics 26 (6-7): 591-608.
- Aziz, S. A., B. L. Steward, L. Tang, M. Karkee. 2009. Utilizing repeated GPS measurement form field -operations for development of agricultural field DEM. Transactions of the ASABE 52(4): 1057-1067.
- Karkee, M., B. L. Steward, L. Tang and S. A. Aziz. 2009. Quantifying sub-pixel signature of paddy rice field using an artificial neural network. Computers and Electronics in Agriculture 65(1): 65-76.
- Khot, L. R.*, L. Tang, B. L. Steward and S. Han. 2008. Sensor fusion for improving the estimation of roll and pitch for an agricultural sprayer. Biosystems Engineering 101(1): 13-20.

Briefly list the most recent professional development activities

- Visited China Agricultural University, Zhejiang University, Jiangsu University, Nanjing Forestry University, Institute of Agricultural Mechanization, National Engineering Research Center for Information Technology in Agriculture, China
- Visited Federal University of Vicosa and Federal University of Champina Grande, Brazil
- Multistate Research Team Pre-proposal meeting on Automation for Vegetable Crops for the USDA Specialty Crop Research Initiative Grant Program, Washington State University
- Annual International Meeting of the American Society of Agricultural and Biological Engineers, Louisville, KY

U. Sunday Tim, Associate Professor

Education

- Ph.D. Civil and Environmental Engineering, Concordia University, Montreal, Canada, 1987
- B.Eng. (with distinction) Civil Engineering, Concordia University, Montreal, Canada, 1982

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time

- 1995-Present: Associate Professor, Agricultural & Biosystems Engineering (full-time)
- 1990-1995: Assistant Professor, Agricultural & Biosystems Engineering (full-time)
- 1987-1990: Research Associate, Agricultural Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA

Current membership in professional organizations

- American Association for the Advancement of Science (AAAS)
- American Chemical Society
- American Water Resources Association
- Sigma Xi
- International Association for Hydrological Research

Honors and awards

- Brenton Center for Agricultural and Technology Transfer Award (2008)
- Wakonse Faculty Fellow (2004)
- USDA Award for Excellence – Geospatial Information Partnership (2001)

Service activities (within and outside of the institution)

- College of Agriculture and Life Sciences Global Agriculture Programs Committee
- ISU Library Advisory Committee
- ISU Administrative Support Programs Advisory Committee
- ISU Faculty Policy Review Board
- ISU Traffic Appeals Board
- Affiliate, AAAS

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Sharma, S. U.S. Tim, S. Gardia, and P. Smith. 2011. Geospatial pattern determination for SNAP eligibility in Iowa using GIS. *Advances in Computing and Communications*, Part I, 190: 191-200

Briefly list the most recent professional development activities

Research Grant Review Panels:

NSF CREST/ HBCU-RISE
NSF Earth Sciences Directorate
USDA National Needs Fellowship Grant Program
NOAA Educational Partnership Programs
US EPA STAR Fellowships Program
US EPA Greater Research Opportunities Program
US EPA SBIR Grant Program
Lytmos Group

Journals

Journal of Environmental Science and Technology
Journal of Hydrology
Journal of Hydrological Sciences

Hongwei Xin, Professor

Education

- Ph.D. Engineering (Bio-environmental Engineering Field) University of Nebraska-Lincoln, 1989
- M.S. Agricultural Engineering, University of Nebraska-Lincoln, 1985
- B.S. Agricultural Engineering, Shenyang Agricultural University, China, 1982

Academic experience

- 2011-present: Associate Chair for Research, Department of Agricultural and Biosystems Engineering, Iowa State University (ISU)
- 2008-present: Director, Egg Industry Center, ISU
- 2002-present: Professor, Department of Animal Science, ISU
- 2002-present: Professor, Department of Agricultural and Biosystems Engineering, ISU
- 1998-2002: Associate Professor, Department of Agricultural and Biosystems Engineering, ISU
- 1993-1998: Assistant Professor, Department of Agricultural and Biosystems Engineering, ISU
- 2007-2008: Professor, Department of Biosystems and Agricultural Engineering, University of Kentucky
- 1990-1993: Post-doctoral research Associate, Department of Biological and Agricultural Engineering University of Arkansas
- 1990: Post-doctoral Research Associate, Department of Biological Systems Engineering, University of Nebraska

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- American Society of Heating, Refrigerating and Air-Conditioning Engineers
- Alpha Epsilon Honor Society of Agricultural Engineers
- Association of Overseas Chinese Agricultural, Biological and Food Engineers
- Poultry Science Association
- Sigma Xi Scientific Research Society

Honors and awards

- Midwest Poultry Consortium Outstanding Service Award (2011)
- Iowa State University (ISU) Award for Outstanding Achievement in Research (2010)
- ISU College of Agriculture and Life Sciences Outstanding Achievement in International Agriculture Award (2010)
- Appeared in the History Channel Show "The Modern Marvels: Eggs" (First aired Jan 20, 2010)
- ISU College of Agriculture and Life Sciences Outstanding Research Award (2009)
- President's Citation Award, the American Society of Agricultural and Biological Engineers (ASABE) (2009)
- ISU College of Engineering David R. Boylan Eminent Faculty Research Award (2008)

- Fellow of the American Society of Agricultural and Biological Engineers (ASABE) (2008)
- Appointment to the USDA Agricultural Air Quality Task Force (2008-11, 2011-2013)
- Iowa Poultry Association 2007 Industry Person of the Year Award (2007)

Service activities (within and outside of the institution)

- College of Agriculture and Life Sciences Diversity Committee
- College of Engineering Research Committee
- ABE Promotion and Tenure Committee
- ABE International Programs Committee
- ABE Space Advisory Committee
- Iowa Egg Council Board Member
- Planning Committee for the 9th International Livestock Environment Symposium
- Chair of the United Egg Producers Environmental Scientific Panel on Air Emissions
- Scientific Advisory Committee for the Key Laboratory on Agricultural Structures and Environment, China Agricultural University, Beijing China

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Chepete, J.H., H. Xin, and H. Li. 2012. Effect of partially covering turkey litter surface on ammonia emission. 2011. J. App. Poult. Res. (in press)
- Chepete, J.H., H. Xin, H. Li. L. Mendes, and T. Bailey. 2012. Ammonia emission and performance of laying hens as affected by different dosages of yucca schidigera. J. App. Poult. Res. (in press)
- Li, H., H. Xin, R. T. Burns, S.A. Roberts, S. Li, J. Kliebenstein, and K. Bregendahl. 2012. Reducing ammonia emissions from high-rise laying-hen houses through dietary manipulation. J. Air and Waste Management Association 62(2):160-169.
- Rahman, S., H. Xin, S.A. Roberts, J.A. Arthur, R.T. Burns, H. Li, Z. Zhu, L.B. Moody, K. Bregendahl. 2012. Effects of laying-hen variety on manure properties and ammonia emission. Transactions of the ASABE (in press)
- Walker, L., T. Wang, H. Xin, and D. Dolde. 2012. Supplementation of laying-hen feed with palm tocos and algal astaxanthin for egg yolk nutrient enrichment. J. Agric. Food Chem. 60:1989-1999.
- Zhu, Z., H. Xin, H. Li, and H. Dong. 2012. Assessment of tubing type on ammonia gas adsorption. Applied Engineering in Agriculture 28(2):265-269.
- Chepete J.H., H. Xin, and H. Li. 2011. Ammonia emissions of laying hen manure as affected by accumulation time. J. Poul. Sci., 48:138-143.

Briefly list the most recent professional development activities

- Attending and presenting at ASABE Annual International Meetings
- Attending and delivering invited keynote speeches at various professional conferences (WPC – Brazil, Aug 5-10, 2012; , ILES 9 – Spain, July 8-12, 2012; International Symposium on Egg Production and Processing – Beijing, China, June 18-20, 2012)

Chenxu Yu, Assistant Professor

Education

- Ph.D. Biological Systems Engineering, University of Wisconsin-Madison, 2003
- M.S. Biochemical Engineering, Dalian Polytechnic University, Dalian, PRC, 1998
- B.S. Physics and Astronomy, Nanjing University, Nanjing, PRC, 1993

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time

- 2007-Present: Assistant Professor (50% Teaching; 50% Research), Agricultural & Biosystems Engineering
- 2006-2007: Postdoctoral Research Associate, Agricultural & Biological Engineering, Purdue Univ.
- 2003-2005: Postdoctoral Research Associate, Agricultural & Biological Engineering, The Penn State University
- 1998-2003: Graduate Research Assistant, Biosystems Engineering, University of Wisconsin-Madison
- 1995-1998: Graduate Research Assistant, Non-aqueous Enzymology Lab, Dalian Polytechnic University

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time

- 1993-1995: Computer Engineer, China Construction Bank, Dalian Branch

Certifications or professional registrations

None

Current membership in professional organizations

- American Society of Agricultural and Biological Engineers
- Institute for Food Technologists
- American Chemical Society
- Biophysical Society
- Institute of Biological Engineering

Honors and awards

- Engineering student council outstanding club advisor award, 2012

Service activities (within and outside of the institution)

- Guest Professor, Dalian Polytechnic University, School of Biotechnology
- Guest Professor, Donghua University, Institute of Biological Sciences
- Orchestrated the development of 2+2 exchange program between ISU and DPU (MOU signed in 2011)
- Chair, Biosensor committee, ASABE
- ABE Technology Curriculum Committee
- ABE Promotion, Tenure and Review Committee

- ABE Social Committee
- College of Agriculture and Life Sciences Outcomes Assessment Committee
- ISU representative to USDA CSREES Multistate Project Committee NC-1031/NC-1194, Nanotechnology and Biosensors

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Wang, Q., S. Lonergan and C. Yu. 2012. Rapid determination of pork sensory quality using Raman spectroscopy". *Meat Science*, 91(3), 232-239
- Wang, Q., C. Yu. 2012. Chemical and Biological Sensing and imaging using plasmonic nanoparticles and nanostructures, in *Biomedical nanosensors*, edited by J. Irudayaraj, pp 59-95, Pan Standford Publishing Pte. Ltd., ISBN 978-981-4303-03-3
- Wang, Q., S. Grozdanic, M. H. Harper, N. Hamouche, H. Kecova, T. Lazic and C. Yu. 2011. Exploring Raman spectroscopy for the evaluation of glaucomatous retinal changes. *Journal of Biomedical Optics*, 16(10), 107006.
- Fu, Y., H. Yu, X. Hu, Chenxu Yu and F. Jin. 2010. New dioscin-glycosidase hydrolyzing multi-glycosides of dioscin. *Journal of Microbiology and Biotechnology*, 20(6), 1011-1017.
- Wang, Q., N. Xiao and Chenxu Yu. 2010. Detection and identification of microorganisms in mixed cultures by nanoparticle enhanced FTIR spectroscopy and chemometrics. *Transactions of ASABE*, 53(3): 999-1006.
- Xiao, N., Chenxu Yu. 2010. Rapid-response and highly sensitive non-crosslinking colorimetric nitrite sensor using 4- aminothiophenol modified gold nanorods. *Analytical Chemistry*, 82 (9), 3659–3663.
- Yu, Chenxu, J. Hale, K. Ritchie, N. K. Prasad and J. Irudayaraj. 2009. Quantitative determination of the effect of receptor expression level on EGF-EGF Receptor interaction kinetics in live cells using real time single molecule analysis. *Biochemical and Biophysical Research Communications*, 378(3): 376-382.
- Sun, L., Chenxu Yu, J. Irudayaraj. 2008. Raman Multiplexers for alternative gene splicing. *Analytical Chemistry* 80(9); 3342-3349.
- Ganjoo, A., H. Jain, Chenxu Yu, J. Irudayaraj, C. G. Pantano. 2008. Detection and fingerprinting of pathogens: mid-IR biosensor using amorphous chalcogenide films. *Journal of Non-Crystalline Solids*, 354: 2757-2762.
- Yu, C., J. Irudayaraj, 2008. Sensitivity and selectivity limits of multiplex nanoSPR biosensor assays" in *Nanoparticles: Synthesis, Stabilization, Passivation and Functionalization*, edited by R. Nagarajan, ACS Symposium Series, pp386-402, Oxford University Press.

Briefly list the most recent professional development activities

- Annual meeting of Institute of Biological Engineering, IN 2012
    - Chaired the Imaging and Biodiagnostics Session
- Lab-on-a-chip World Congress, San Francisco, CA 2011
- Annual International meeting of the American Society of Agricultural and Biological Engineers, Louisville, KT 2011

APPENDIX C: Major Instructional Equipment List

Room	Area (ft^2)	Name	Key Equipment and Tools	Faculty Member In Charge
142 Davidson	1716	Biomaterials Lab	Grain dryers, grain moisture testers, hood, MTS-Syntech (materials testing workstation), grain respirometer, controlled environment chambers	Bern
143 Davidson	861	Electric Power and Electronics Lab	Oscilloscopes, programmable logic controllers, motors, electric meters, array of electrical measurement devices, generator	Bern
147 Davidson	1260	Deere Engines Lab	John Deere 4.6L diesel engines (10), John Deere diesel engine + dynamometer, Brigg and Stratton 5 hp small engines (15)	Birrell
150 Davidson	1013	Fluid Power Laboratory	Sauer-Danfoss electro-hydraulic test stands (3) (should be 6 by fall), Parker electro-hydraulic test stand (1), Vickers hydraulic test stands (2), pneumatic test stands (2), PID controllers, Sauer Danfoss hydrostatic transmissions, Husco valves, misc. hydraulic components	Steward
Advanced Machinery Systems Shed	6000	Power and Machinery Laboratory	John Deere 7920 Tractor, soil tillage bin, transmission test stand, seed metering stands, miscellaneous equipment cut-aways	Birrell, Steward

APPENDIX D: Institutional Summary

1. The Institution

Iowa State University of Science and Technology
Ames, Iowa 50011

a. Name and title of the chief executive officer of the institution:
Dr. Steven Leath, President

b. Name and title of the person submitting the self-study report:
D. Raj Raman, Professor and Associate Chair for Teaching

c. Name the organizations by which the institution is now accredited and the dates of the initial and most recent accreditation evaluations:
Iowa State University is accredited by the Higher Learning Commission, a commission of the North Central Association of Colleges and Schools. Iowa State has been continuously accredited since 1916. The most recent accreditation was in 2006. The next accreditation review will be in 2016.

2. Type of Control

Iowa State University is a public institution of the State of Iowa. It is managed by the Iowa Board of Regents.

3. Educational Unit

Please refer to Figures 1 and 2 above for organizations charts. Briefly: The A E program is one of four undergraduate degree programs in the Agricultural and Biosystems Engineering Department at Iowa State University. The A E program is located within the College of Engineering. The administrative chain of responsibility from the individual responsible for the program to the chief executive officer of the institution is as follows:

- D. Raj Raman, Chair of the ABE Engineering Curriculum Committee. Reports to:
- Steven K. Mickelson, Professor and Chair of ABE. Reports to:
- Interim Dean, College of Engineering (To Be Named). Reports to:
- Jonathan A. Wickert, Executive Vice President and Provost. Reports to:
- Dr. Steven Leath, President

4. Academic Support Units

Table D.4-1. Academic Support Units

Academic Support Units		
Unit	**Name**	**Title**
Agronomy	Kendall Lamkey	Professor and Chair
Biology Program	James Colbert	Associate Professor, EEOB
Chemical and Biological Engineering	Surya Mallapragada	Professor, Chair and Stanley Chair in Interdisciplinary Engineering
Chemistry	William Jenks	Professor and Chair
Civil, Construction and	Terry Wipf	Pitt-Des Moines Professor and Interim Chair

Environmental Engineering		
Industrial and Manufacturing Systems Engineering	Janis Terpenny	Walkup Professor and Chair
Materials Science and Engineering	Richard LeSar	Gleason Professor of Interdisciplinary Engineering and Chair
Mechanical Engineering	Ted Heindel	Bergles Professor of Thermal Science and Interim Chair
Economics	John Schroeter	Professor and Interim Chair
English	Barbara Ching	Professor and Chair
Library	Olivia Madison	Professor and Dean
Mathematics	Wolfgang Kleimann	Professor and Chair
Physics	Joseph Shinar	Professor and Chair

5. Non-academic Support Units

Table D.5-1. Non-academic Support Units

Non-academic Support Units		
Unit	**Chair**	**Title**
Learning Communities	Doug Gruenewald	Co-Director
Center for Excellence in Learning & Teaching	Ann Marie VanDerZanden	Director
Library	Olivia Madison	Dean
ISU Information Technology	Jim Davis	Vice Provost/CIO
Engineering Career Services	Brian Larson	Program Director
Student Success Center	James Dorsett	Interim Dean of Students
Engineering Student Services	Joel Johnson	Program Manager I
Engineering Information Technology	Jason Shuck	Systems Analyst II
Engineering-LAS Online Learning	Tom Brumm	Professor-in-charge

6. Credit Unit

One semester credit represents one class hour or three laboratory hours per week. The fall and spring semesters are each 16 weeks long and include a week for final examinations. Thus one academic year is 30 weeks of classes.

7. Tables

Please see the following pages for Tables D-1 and D-2.

Table D-1. Program Enrollment and Degree Data.
Official fall term enrollment figures, and undergraduate degrees conferred during each of those years. FT = full time, PT = part time
Agricultural Engineering

	Academic Year		Enrollment Year					Total Undergrad	Total Grad	Degrees Awarded			
			1st	2nd	3rd	4th	5th			Associates	Bachelors	Masters	Doctorates
Current Year	F11	FT	51	30	23	52		156			34		
		PT	1	2	2	3		8					
1	F10	FT	41	28	42	41		152			25		
		PT		1	1	4		6					
2	F09	FT	51	43	37	50		181			41		
		PT			4	3		7					
3	F08	FT	54	36	34	46		170			32		
		PT		1	3	7		11					
4	F07	FT	41	32	32	39		144			23		
		PT			5	7		12					

Table D-2. Personnel

Agricultural Engineering, 2012

	HEAD COUNT		FTE[2]
	FT	PT	
Administrative[3]			
Faculty (tenure-track)	22	3	
Other Faculty (excluding student Assistants)	3	1	
Student Teaching Assistants	2	4.5	
Student Research Assistants	55		
Technicians/Specialists	22		
Office/Clerical Employees	10	0.5	
Others[4]	5	0.5	

Report data for the program being evaluated.

[1] Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.

[2] For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc. For faculty members, 1 FTE equals what your institution defines as a full-time load.

[3] Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.

[4] Specify any other category considered appropriate, or leave blank.

APPENDIX E: OPAL Competencies Mapping To Student Outcomes.

Numbers indicate weighting of competency with respect to contribution to outcome.

A E Program Outcome	Workplace Competency													
	Engineering Knowledge	General Knowledge	Continuous Learning	Quality Orientation	Initiative	Innovation	Cultural Adaptability	Analysis and Judgment	Planning	Communication	Teamwork	Integrity	Professional Impact	Customer Focus
a. ability to apply knowledge of mathematics, science, and engineering	4.8		3.8		3.5			4.2						
b. ability to design and conduct experiments, as well as to analyze and interpret data	4.4		3.6	4.2	3.7	4.0		4.5	4.1		3.4			3.3
c. ability to design a system, component, or process to meet desired needs within realistic constraints	4.4		3.8	4.1	3.9	4.3	3.0	4.5	4.1	3.9	3.8			4.2
d. ability to function on multi-disciplinary teams					4.0		4.3	3.6	3.8	4.7	4.9	4.3	3.9	3.6
e. ability to identify, formulate and solve engineering problems	4.6		3.8	3.9	4.1	4.2		4.3		3.6	3.5			3.5
f. understanding of professional and ethical responsibility		3.8	3.6	3.2			3.7	3.5				4.8		
g. ability to communicate effectively		3.8			3.7					4.9			4.3	4.0
h. broad education necessary to understand the impact of engineering solutions in a global and societal context	3.3	3.9	3.9				4.1	3.4						
i. recognition of the need for and an ability to engage in life-long learning			4.6		4.1									
j. knowledge of contemporary issues		3.7	3.8				3.7	3.1						
k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice.	4.3		4.1	3.6	3.7		2.6	4.0						

IOWA STATE UNIVERSITY

Department of Agricultural and Biosystems Engineering

Bachelor of Science in Agricultural Engineering Degree Program - ABET Evaluation

November 4-6, 2012

Agricultural and Biosystems Engineering Department

Iowa State University

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