Texas A&M University
Biological & Agricultural Engineering Department
Academic Program Review
March 22-25, 2015

Academic Program External Review Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Alan Hansen</td>
<td>University of Illinois</td>
</tr>
<tr>
<td>Dr. Bradley Marks</td>
<td>Michigan State University</td>
</tr>
<tr>
<td>Dr. Steven Mickelson</td>
<td>Iowa State University</td>
</tr>
<tr>
<td>Dr. Sue Nokes, Review Team Chair</td>
<td>University of Kentucky</td>
</tr>
</tbody>
</table>

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The Academic Program Review (APR) process at Texas A&M University provides the occasion for academic units to plan strategically, assess the quality and efficacy of their programs, and determine the best courses of action for ongoing improvement. APR is at the heart of our institutional commitment to excellence, and we sincerely thank you for assisting us. This letter provides you with the charge to the committee and a brief overview of the department.

Peer Review Team Charge
Please examine the department and its programs and make recommendations that will help in planning improvements. Your resources are a self-study report prepared by the department, copies of materials from the program's last review, information you gain through personal interactions while visiting Texas A&M University, copies of strategic plans and goal-setting documents at the department, college, and/or university level, and any additional information requested by you or by the department. Within the broad charge of recommending ways the department can continue to improve are some specific questions that we would like you to address:

• Based on the data / information provided in the self-study report or gathered by the review team, what are the department's overall strengths and weaknesses?

• How well do the department’s strategic goals align with those of its college and with those of Texas A&M University?

• How would you compare this department with its peers? Are program outputs at a quantity and quality typical of the best departments in the discipline? How do the resources available to the department (budget, facilities, staffing, etc.) compare to those of the top departments in the discipline?

• What improvements (including student learning and faculty development) has the department made since the previous program review?

• Has the department adequately improved biological engineering component of the engineering program?

• With only current resources or a modest infusion of new ones, what specific recommendations could improve the department’s performance, marginally or significantly?
Biological & Agricultural Engineering
Academic Program Review
Preliminary Itinerary

SUNDAY, MARCH 22, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00-5:00 p.m.</td>
<td>Review team arrives in College Station. Reservations in TAMU-Memorial Student Center (MSC).</td>
</tr>
<tr>
<td>6:00 p.m.</td>
<td>Dinner hosted by Dr. Steve Searcy.</td>
</tr>
</tbody>
</table>

MONDAY, MARCH 23, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30-8:30 a.m.</td>
<td>Entry interview with the Provost’s Administrative Team at the MSC. Continental breakfast provided. Dr. Searcy will escort to Scoates Hall.</td>
</tr>
<tr>
<td>9:00-10:00 a.m.</td>
<td>Meeting with College Deans, Room 305 Scoates Hall. Dr. Alan Sams, College of Agriculture &amp; Life Sciences. Dr. N.K. Anand, Dwight Look College of Engineering.</td>
</tr>
<tr>
<td>10:00-11:30 a.m.</td>
<td>Meet with BAEN Department Administrative Team. Dr. Steve Searcy, Department Head. Dr. Zivko Nikolov, Associate Head for Academic Programs. Dr. Saqib Mukhtar, Associate Head for Extension.</td>
</tr>
<tr>
<td>11:30-1:00 p.m.</td>
<td>Lunch (participants to be determined)</td>
</tr>
<tr>
<td>1:00-2:30 p.m.</td>
<td>Tour departmental facilities—Dr. Ron Lacey coordinating.</td>
</tr>
<tr>
<td>2:30-3:00 p.m.</td>
<td>Break</td>
</tr>
<tr>
<td>3:00-4:30 p.m.</td>
<td>Meet with faculty in sub-discipline areas, Room 305 Scoates Hall.</td>
</tr>
<tr>
<td>5:00-6:30 p.m.</td>
<td>Faculty reception</td>
</tr>
<tr>
<td>6:30 p.m.</td>
<td>Dinner catered to MSC Reviewer Workroom</td>
</tr>
</tbody>
</table>

TUESDAY, MARCH 24, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>7:30-8:30 a.m.</td>
<td>Breakfast at MSC.</td>
</tr>
<tr>
<td>9:00-10:30 a.m.</td>
<td>Meet with faculty committees, Room 305 Scoates Hall.</td>
</tr>
<tr>
<td>10:30-11:30 a.m.</td>
<td>Meet with undergraduate students, Room 305 Scoates Hall.</td>
</tr>
<tr>
<td>11:45-1:30 p.m.</td>
<td>Lunch with College department heads.</td>
</tr>
<tr>
<td>2:00-2:30 p.m.</td>
<td>Meet with BAEN Graduate Program Team, Room 305 Scoates Hall.</td>
</tr>
<tr>
<td>2:30-3:30 p.m.</td>
<td>Meet with graduate students, Room 305 Scoates Hall.</td>
</tr>
<tr>
<td>3:30-5:00 p.m.</td>
<td>Open time</td>
</tr>
<tr>
<td>6:00 p.m.</td>
<td>Dinner catered to MSC Reviewer Workroom</td>
</tr>
</tbody>
</table>

WEDNESDAY, MARCH 25, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30-9:00 a.m.</td>
<td>Exit interview with Provost’s Administrative Team and the Dean. Continental breakfast provided. MSC Reviewer Workroom.</td>
</tr>
<tr>
<td>9:00-10:00 a.m.</td>
<td>Reviewers debrief Dr. Searcy, MSC Reviewer Workroom</td>
</tr>
<tr>
<td>10:00-11:00 a.m.</td>
<td>Reviewers finalize draft report</td>
</tr>
<tr>
<td>11:00-12:00 a.m.</td>
<td>Reviewers brief faculty, staff, and students on final report, Room 305 Scoates Hall</td>
</tr>
<tr>
<td>12:00-1:00 p.m.</td>
<td>Lunch with Dr. Searcy</td>
</tr>
<tr>
<td>1:00-3:00 p.m.</td>
<td>Reviewers depart College Station</td>
</tr>
</tbody>
</table>
The Biological and Agricultural Engineering (BAEN) program review was initiated at the request of the Provost of Texas A&M University, with the stated purpose of improvement of the quality of academic programs at Texas A&M. This BAEN program review covers five graduate and two undergraduate degrees.

The entire self-study consists of four main documents; Self-Study Overview and three reports on the BAEN graduate programs, the BAEN undergraduate engineering program, and the Agricultural Systems Management (AGSM) curriculum. The overview document is intended to serve as a summary that highlights the more important points, and provides pointers to more detailed information in the associated documents. The Self-Study Overview also addresses specific points requested by the Provost.

The Graduate Program Self Study Report covers all of the graduate degrees in both BAEN and AGSM. In addition to relevant information and data about the BAEN graduate degrees, the Graduate Program Self Study Report contains facilities descriptions and faculty biographical data.

The BAEN undergraduate engineering degree at Texas A&M was reaccredited in 2010 by ABET. The next reaccreditation review is scheduled for 2016. A report prepared for the 2015 mock ABET review has been provided as a separate document entitled Undergraduate Engineering Programs Self Study Report.

The Agricultural Systems Management (AGSM) curriculum was evaluated by the P-206 Agricultural Technology and Management Curriculum Review and Program Recognition committee of the American Society of Agricultural and Biological Engineers (ASABE) in 2009. The curriculum was recognized for a six year period, with suggestions for improvement of the curriculum. Since that time the faculty has responded to those suggestions and made additional changes to the curriculum to strengthen the AGSM program. An updated version of the ASABE recognition document has been generated for this review. This version includes all the curriculum changes made up to the current academic year. This report is entitled Agricultural Systems Management Curriculum Self Study Report.

By the nature of different reporting processes, there is some duplication of information between various documents.

The review portfolio contains the additional supporting documents:

- High Impact Learning Experiences Report
- BAEN 2014-2019 Strategic Plan and
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Introduction to BAEN Department

History

Agricultural Engineering courses (irrigation, drainage, fertilizers and farm management) were taught at Texas A&M as early as 1891 in what was then the Department of Agriculture. In 1911, a School of Agriculture and a School of Engineering were established. Within each school, departments were created based upon subject matter. The agricultural engineering courses were moved to the Department of Agronomy within the School of Agriculture. A Department of Agricultural Engineering was created within the Department of Agronomy in 1914, and in 1915 became an independent department.

In 1946 there was a threat to the program because of the perceived lack of engineering coordination and rigor. The program became jointly administered by the Deans of the Schools of Agriculture and Engineering in 1947 and in 1950, the Engineers' Council for Professional Development (predecessor to Accreditation Board for Engineering and Technology) approved accreditation of the four-year curriculum in Agricultural Engineering at Texas A&M. Thus, the engineering degree is celebrating its 64th year of continuous accreditation.

A curriculum in mechanized agriculture was established and administered by the Department of Agricultural Engineering in 1967. The degree and program name were changed to Agricultural Systems Management (AGSM) in 1988 to emphasize the technical management focus of the curriculum.

The department established the Master of Science in Agricultural Engineering in 1924, and the Doctor of Philosophy degree in Agricultural Engineering in 1967, one of ten such degrees offered across the U.S. at the time. In addition, the Master of Agriculture, Master of Engineering and the Doctor of Engineering Degrees were approved in 1974.

In the 1990s, the Agriculture Engineering programs around the country were changing their program names and emphases, often in response to reductions in undergraduate enrollment. By the year 2000, most of the Agricultural Engineering Departments in the U.S. had changed their names to reflect the new directions taken by the professional society. Texas A&M did not suffer low student numbers during that period, and as a result, was slower in making a change. In 2001, the name of the department was changed from Agricultural Engineering to Biological and Agricultural Engineering and the names of the M.S., M. Eng. and Ph.D. degrees offered were changed to Biological and Agricultural Engineering as well. These changes reflected the evolution of departmental programs over the previous half century as well as changes in the profession at the national level. In 2006, the two programs (AGEN and BSEN) that existed since 1997 were merged into a single curriculum in Biological and Agricultural Engineering (BAEN). The first students with a B.S. in BAEN graduated in 2010, and we requested that ABET change the name of the program in agricultural engineering at Texas A&M to Biological and Agricultural Engineering. The BSEN program was terminated, and the last students graduated with this degree in May 2009. The BAEN B.S degree was accredited under both biological engineering and agricultural engineering criteria in 2010.
Mission and Goals

Departmental Mission, Vision and Goals

The following are extracted from the current BAEN strategic plan that is included in the self-study materials under subheading “2014-2019 Strategic Plan.”

Vision: To be recognized internationally as a premier department of its kind, known for faculty and graduates who devise solutions to global grand challenges in food, fiber, and environmental sustainability.

Mission: To protect and sustain the environment, improve health, and feed the world through innovative education, research, and extension programs in Machine and Energy Systems, Food and Bioprocessing, and Environment and Natural Resources.

Goals: Proposed departmental goals that capture strategic challenges and goals of the College of Agriculture and Life Sciences (COALS) and the Dwight Look College of Engineering College (COE) are listed below.

1. Enhance graduate employability
2. Develop and implement emerging technologies in food and agricultural applications.
3. Prepare versatile, resilient, and globally globally-competent graduates.
4. Expand instructional diversity while maintaining high standards of excellence.
5. Expand multidisciplinary and integrated research and outreach programs
6. Expand current and develop new revenue sources.
7. Regain and expand capacity to meet growing extension education and lifelong learning needs.

Administrative organization

The BAEN department is administratively located in the College of Agriculture and Life Sciences (COALS). The engineering degrees offered by the department are jointly administered by the COALS and the Dwight Look College of Engineering, and the AGSM degree is administered by COALS. The department head and faculty participate in the administrative committees of both colleges.

COALS is one entity within Texas A&M Agriculture. Unlike many land grant universities, the research and extension missions are not located within the university, but are separate agencies within the Texas A&M University System. Texas A&M University is also a unit within the Texas A&M University System. The Texas AgriLife Research has responsibility for agricultural research, while Texas AgriLife Extension Service is the agency with primary responsibility for outreach within the state. COALS, AgriLife Research and Extension Service (plus other agencies that do not impact BAEN) are collectively referred to as the Texas A&M Agriculture program. This administrative structure has many implications for the department. The university and the agencies have separate budgets and receive unrelated allocations from the
state legislature. The department head is responsible to the chief executive officers of the three parts of Texas A&M Agriculture.

Traditionally, BAEN faculty members have had joint appointments with the university and one or more of the agencies (and thus multiple budget sources for their salaries). In recent years, faculty positions have been added that are entirely on the university budget. Research and teaching expectations for individual faculty are set by the department head, with little consideration for the budget source of the salary. However, budget source is important in personnel management. Plans are in place to transition faculty in COALS to nine months on the university budget, but details regarding that transition are not yet available to the department. Greater detail on the budgets from the different agencies is included in the Budget Information section of this report.

The departmental faculty does include individuals without an academic appointment with Texas A&M University. These are primarily Extension faculty members and Research faculty located at outlying centers. University regulations require that a faculty member have a significant portion of their appointment with the university to be eligible for tenure. The department currently has a total of 30 faculties (24 in College Station; 4 in R&E Centers, 1 in University administration and 1 on long term leave). There are 3 Regents Professors, 1 Distinguished Professor, 12 Professors, 9 Associate Professors, and 2 Assistant Professors. Three of them are appointed to Chairs, and three are appointed to Professorships (Table 1). The full faculty of the Department includes individuals with a majority appointment in BAEN and with an academic title of professor, associate professor, or assistant professor. Individuals with majority appointments in BAEN as Distinguished Lecturer, Senior Lecturer, Lecturer, or Professor of Practice are also members of the full faculty. Affiliated faculty (8 total) have their disciplinary home in BAEN, but are administratively located in other units.

Of the 30 professorial rank faculty administratively located within the department, 9 of those have non-tenure/tenure track appointments and 6 are females. Three faculty members are Hispanic.

This academic program review is concentrated on the teaching and research activities of the department, and does not cover outreach activities. Faculty members with majority Extension appointments are members of the university’s Graduate Faculty, and do supervise graduate students. The contributions of those faculty members in the graduate programs and research activities are included in the Graduate Program Self-Study Report.
Table 1. Biological and Agricultural Engineering Faculty

<table>
<thead>
<tr>
<th>Rank</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenured/Tenure-Track Faculty</td>
<td></td>
</tr>
<tr>
<td>• Full Professors (including Regents and Distinguished ranks)</td>
<td>13</td>
</tr>
<tr>
<td>• Associate Professors</td>
<td>6</td>
</tr>
<tr>
<td>• Assistant Professors</td>
<td>2</td>
</tr>
<tr>
<td>Non-Tenure Track (Extension) Faculty</td>
<td></td>
</tr>
<tr>
<td>• Full Professors</td>
<td>3</td>
</tr>
<tr>
<td>• Associate Professor</td>
<td>3</td>
</tr>
<tr>
<td>Instructional Associate Professor</td>
<td>1</td>
</tr>
<tr>
<td>Assistant Professor of Practice</td>
<td>1</td>
</tr>
<tr>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Faculty</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

The department is administered with a shared governance model regarding departmental direction and academic issues (Figure 1). The department head has responsibility for personnel actions and resource allocation, and these are strongly affected by the department’s strategic plan. The faculty participates in standing committees that address the major issues facing the department. Recommendations are made to the faculty as a whole, which votes on the recommended actions. Details on how actions are proposed, decided and implemented are covered by the BAEN Process Manual (provided as part of the self-study materials). The Department Head has responsibility for coordination of the research programs. Coordination of the teaching programs is provided by the Associate Department Head. Each undergraduate program has a faculty member identified as the coordinator for the major. These individuals make decisions regarding admission and retention of students in their respective programs. Graduate admissions are coordinated by the Chair of the Graduate Programs committee. Supervision of graduate students following admission is the responsibility of the faculty member serving as chair of the advisory committee. The individual program reports provide more detailed information on program administration.
Figure 1. Organization chart for Biological and Agricultural Engineering showing both individuals with administrative duties and standing committees of the faculty.
Department Resources

Facilities: (space and equipment)

BAEN is responsible for 31,200 ft² of space in Scoates Hall, 19,000 ft² in the Hobgood Building, 17,000 ft² in the AEPM Building, and 6,850 ft² in the fabrication shop. A commitment of resources both by the Department, the College of Agriculture and Life Sciences and the university has resulted in building and lab renovations and laboratory upgrades. Scoates Hall has just completed a Capital Improvement project that has significantly enhanced the 80+ year old building’s utility and provide limited opportunities for enhancement of departmental space.

Detailed information about teaching and research space and equipment in BAEN is given in Section 1.3 of Graduate Program Self-Study Report.

Finances: Individual budgets are received from TAMU and the AgriLife agencies, and are managed by the department head to enhance the operations of the department. Figure 2 shows the trends in each of these budget sources over the last seven fiscal years, and Table 2 contains the budget details for the previous five years.

![Figure 2. Budget distribution between agencies.](image)

The departmental budgets contain both positive and negative trends. The department has been successful in obtaining three new faculty positions (2 TAMU and 1 extension) in the last two years, and the increases in TAMU and AgriLife Extension budgets for FY13 and FY14 reflect those additions. As can be seen in the financial details (Table 2), an ongoing challenge for the department is the small percentage of resources in operating budget. Between FY10 and FY12, the operating funds was 3.3-3.7% of the total budget. In FY13 and FY14, a differential tuition charge to the students was instituted, and a shifting of faculty and staff salaries resulting in funds available for operating increasing to 6.0 and 6.8%, respectively. While that influx provided the opportunity for improvements in undergraduate instruction, operating funds are still well below...
the 10-15% recommended for stable budgeting. No annual operating allocations are made to faculty for teaching or research activities, while extension faculty receive $1,000-3,000 to cover travel. For research and extension efforts, external grants and contracts provide the operating funds needed for the faculty members to be productive. For teaching, the faculty can request funds for assistantships, graders, teaching consumables and upgrade of teaching facilities.

With the exception of salaries, the research and extension programs of the department depend almost exclusively on external funding. As seen in Figure 3, external grant expenditures in the last 7 years went through a peak in 2011 and since then have significantly declined. The latter is of growing concern for the department as external funding supports our research program, and strongly impacts ability to support graduate students. The department was strongly impacted by the loss of congressionally directed funds, and the faculty has not yet been able to replace those losses. Although we believe the funding situation is likely to improve, the need for external funding will continue indefinitely, requiring the faculty to devote more time to proposal development and grant administration. Unfortunately, the reduction in support staff assistance that has occurred since FY10 results in the faculty’s time being diluted with other tasks. A specific objective of the department that has been unfulfilled due to budgetary constraints is the hiring of a staff proposal development assistant.

Table 2. Five-year budget details for each agency and overall

<table>
<thead>
<tr>
<th>TAMU</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Salaries</td>
<td>$1,442,856</td>
<td>$1,475,555</td>
<td>$1,244,909</td>
<td>$1,325,130</td>
<td>$1,556,239</td>
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<tr>
<td>Support Staff Salaries</td>
<td>$67,674</td>
<td>$70,075</td>
<td>$81,469</td>
<td>$168,250</td>
<td>$205,162</td>
</tr>
<tr>
<td>Operating Budget</td>
<td>$93,775</td>
<td>$61,439</td>
<td>$61,446</td>
<td>$88,319</td>
<td>$118,262</td>
</tr>
<tr>
<td>Total Budget</td>
<td>$1,738,635</td>
<td>$1,741,399</td>
<td>$1,504,516</td>
<td>$1,698,391</td>
<td>$1,996,355</td>
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<table>
<thead>
<tr>
<th>Research</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
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<tbody>
<tr>
<td>Faculty Salaries</td>
<td>$756,893</td>
<td>$761,785</td>
<td>$710,268</td>
<td>$824,635</td>
<td>$866,879</td>
</tr>
<tr>
<td>Support Staff Salaries</td>
<td>$364,156</td>
<td>$313,784</td>
<td>$230,613</td>
<td>$161,778</td>
<td>$170,754</td>
</tr>
<tr>
<td>Operating Budget</td>
<td>$5,680</td>
<td>$22,584</td>
<td>$532</td>
<td>$48,333</td>
<td>$36,783</td>
</tr>
<tr>
<td>Total Budget</td>
<td>$1,126,729</td>
<td>$1,098,153</td>
<td>$941,413</td>
<td>$1,034,746</td>
<td>$1,074,416</td>
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<table>
<thead>
<tr>
<th>Extension</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Salaries</td>
<td>$471,792</td>
<td>$477,552</td>
<td>$358,776</td>
<td>$365,030</td>
<td>$375,859</td>
</tr>
<tr>
<td>Support Staff Salaries</td>
<td>$265,322</td>
<td>$208,848</td>
<td>$190,223</td>
<td>$206,242</td>
<td>$156,367</td>
</tr>
<tr>
<td>Operating Budget</td>
<td>$37,984</td>
<td>$33,881</td>
<td>$52,187</td>
<td>$58,124</td>
<td>$96,202</td>
</tr>
<tr>
<td>Total Budget</td>
<td>$775,098</td>
<td>$720,281</td>
<td>$601,186</td>
<td>$629,396</td>
<td>$628,428</td>
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<table>
<thead>
<tr>
<th>Overall Total</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Salaries</td>
<td>$2,671,541</td>
<td>$2,714,892</td>
<td>$2,313,953</td>
<td>$2,514,795</td>
<td>$2,798,977</td>
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<tr>
<td>Support Staff Salaries</td>
<td>$697,152</td>
<td>$592,707</td>
<td>$502,305</td>
<td>$536,270</td>
<td>$532,283</td>
</tr>
<tr>
<td>Operating Budget</td>
<td>$137,439</td>
<td>$117,904</td>
<td>$114,165</td>
<td>$194,776</td>
<td>$251,247</td>
</tr>
<tr>
<td>BAEN Overall Budget</td>
<td>$3,640,462</td>
<td>$3,559,833</td>
<td>$3,047,115</td>
<td>$3,362,533</td>
<td>$3,699,199</td>
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</table>
Texas A&M University has implemented a number of programs intended to enhance the quality and production of departments and faculty. Figure 4 shows how some of these programs contribute to the university’s strategic plan known as Vision 2020. One anticipated outcome of the self-review process is an evaluation of how the department is contributing to the university’s strategic initiatives. This review process is a portion of the continuous assessment indicated in the figure.

**Vision 2020**

Texas A&M University has developed a long-term vision and mission of becoming a top-ten university by the year 2020 (Vision 2020: Creating a Culture of Excellence). Twelve imperatives were identified in this vision and all major decisions are made with Vision 2020 in mind. The twelve imperatives are:

1. Elevate our faculty and their teaching, research, and scholarship
2. Strengthen our graduate programs
3. Enhance the undergraduate academic experience
4. Build the letters, arts, and sciences core
5. Build on the tradition of professional education
6. Diversify and globalize the A&M community
7. Increase access to knowledge resources
8. Enrich our campus
9. Build community and metropolitan connections
10. Demand enlightened governance and leadership
11. Attain resource parity with the best public universities
12. Meet our commitment to Texas

Of these twelve initiatives, initiatives 1, 2, 3 and 6 are most appropriate for assessment of BAEN departmental impacts.

Figure 4. Relationship between quality improvement processes and strategic planning.

The Quality Enhancement Plan (QEP) at A&M is a course of action for continuous improvement that addresses institutional goals and aspirations, with special attention to student learning outcomes. Developing excellent learning environments permeates the goals of the QEP. Four themes that form the foundation of the QEP include research, diversity, internationalization, and technology. The key indicators of excellence in each of the four QEP themes are as follows:

**Research**: Students should graduate from Texas A&M University able to analyze problems, formulate (research) questions, and progress toward answers to those questions within their fields, modifying these answers as new knowledge dictates.

**Diversity**: Students graduating from Texas A&M University should be able to function successfully in complex, diverse, social, economic, and political contexts. Organizationally, Texas A&M University must create and maintain an environment that promotes an understanding of the importance of diversity in all of its academic endeavors.

**Internationalization**: Students graduating from Texas A&M University will be able to function effectively in their chosen career fields in an international setting.

**Technology**: Students graduating from Texas A&M University will be highly competent in the use of modern technology relevant to their chosen career path.

We believe these indicators are appropriate for assessment of departmental impact and will be used in this report.
The BAEN department activities can be compared to the emphases of both Vision 2020 and the Quality Enhancement Plan. Following are assessments of the department’s status relative to the key indicators of excellence in previously identified imperatives (p. 8 of this report).

**Elevate faculty and their teaching, research, and scholarship**

Figure 5 shows the trends in FTEs in last seven years. Total number of FTEs varied between 19.8 (2012) and 24.1 (2009). Drop in FTE in 2012 was the result of combined TAMU and AgriLife Extension losses. After 2012, TAMU FTEs were recovered but Extension remained flat until recently. We have hired an Associate Professor at the end of FY14 and are currently interviewing for a second Associate Professor to be hired in FY15.

![Figure 5. Recent trends in faculty numbers.](image)

**Quality teaching**

The BAEN department places a strong emphasis on quality teaching programs. This emphasis is enforced in the annual evaluation process, where the department head discusses and evaluates the individual’s efforts to improve instruction, and in the promotion and tenure process, where a peer review of teaching is part of the evaluation process.

The faculty committees that oversee the academic programs of the department have adopted specific educational objectives for each of the programs, and these are highlighted in the individual reports. Assessment of these educational objectives has been formalized to different levels in the different curricula. In the BAEN curriculum, assessment procedures have been implemented and the curriculum modified in response. For the AGSM curriculum, assessments to date have been limited to surveys of graduating students and subjective feedback from the external advisory council. Changes in the curricula and teaching assignments have been made as
a response to this feedback. For the graduate degrees, assessment of educational objectives remains the responsibility of graduate advisory committees of individual students.

One aspect of elevating our faculty is to obtain recognition of outstanding performance. The department’s Recognitions and Events committee has been active and successful in gaining recognitions and awards for teaching, research and service. A significant portion of our faculty has been honored for exceptional performance in teaching since 2007, and those are listed here. Research and service awards are listed on individual curriculum vitae that are included in the Graduate Program Self-Study Report.

<table>
<thead>
<tr>
<th>Name</th>
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<tr>
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<tr>
<td>Sandun Fernando</td>
<td>2014 AFS Distinguished Teaching Award—College Level, College of Agriculture &amp; Life Sciences</td>
</tr>
<tr>
<td>Patricia Smith</td>
<td>2013 AFS Distinguished Teaching Award—University Level</td>
</tr>
<tr>
<td>Calvin Parnell</td>
<td>2012 College of Agriculture &amp; Life Sciences Dean’s Outstanding Achievement Award for Teaching</td>
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</tr>
<tr>
<td>Patricia Smith</td>
<td>2011 AFS Distinguished Teaching Award - College Level, College of Agriculture &amp; Life Sciences</td>
</tr>
<tr>
<td>Sandun Fernando</td>
<td>2011 TAMU System Teaching Excellence Award, a student-selected honor program.</td>
</tr>
<tr>
<td>R. Karthikeyan</td>
<td>2010—2011 College of Engineering Teaching Excellence Award</td>
</tr>
<tr>
<td>Sandun Fernando</td>
<td>2010 TAMU System Teaching Excellence Award, a student-selected honor program.</td>
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<tr>
<td>Clyde Munster</td>
<td>2010 TAMU Bush Excellence Award for Faculty in International Teaching</td>
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<td>Patricia Smith</td>
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</tr>
<tr>
<td>Ann Kenimer</td>
<td>2007 Piper Professor Award</td>
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**Strengthen BAEN graduate programs**

Total graduate student enrollment increased steadily through 2013 (Figure 6). A reduction in from 86 in 2013 to 70 students in 2014 reflects both improvement in the economy and reduced contract and grants expenditures (Figure 2). For example, funded grad student number dropped from 52 in 2013 to 39. Domestic graduate students are typically harder to attract when
the economy improves. International students have been difficult to get due to visa issues and until recently few qualified students would consider coming in without assistantships. The later trend seems to be changing as we have seen more self-funded graduate students since 2009 (Figure 7). The enrolment drop in 2014 seems to be a short-term variation because the current grad student number is 94 – an all-time high.

![Gradate Student Distribution](image)

**Figure 6. BAEN graduate student enrollment (2008-2014)**

The department supports 11-12 graduate teaching assistantships per semester from TAMU funds. The remainder of the supported students are on research or Extension assistantships controlled by faculty. The College of Agriculture and Life Sciences has a pool of funds for tuition payments, but those go primarily to PhD candidates on teaching assistantships. Graduate students supported through an agency (e.g., AgriLife Research and Extension) do not automatically receive tuition payments, but most faculty will cover tuition when they have the funds. Texas law does not allow waivers of in-state tuition for students on graduate assistantships, so that limitation put us at a competitive disadvantage relative to those universities that have that ability. To ease the financial burden on self-funded students (who typically pay both in and out of state tuition), the Department of Biological & Agricultural Engineering has been offering $1000/year scholarships. These competitive scholarships are offered to students based on financial need and academic performance. Recipients of these scholarships are eligible to pay in-state tuition only.
Improvement of any graduate program is based on attracting and retaining highly qualified graduate students. Such students are attracted by several aspects of a university and department, including the quality and reputation of faculty advisors, availability of financial support and the availability of facilities to support research. The BAEN department continually addresses each of these points.

BAEN department provides an excellent multicultural environment where students can flourish while sharing each other’s unique backgrounds and life experiences. The graduate student population is distributed evenly between international and domestic students. Of the domestic students, approximately 40% belong to minority ethnicities (African American and Hispanic). Also, 43% of the current graduate student body is females.

The application and review processes for admission to graduate study have been substantially revamped to speed-up the process and make it more user friendly. Most of these processes are now done by electronic submission. The significant increase in graduate enrolment in 2009 is also reflected in the number of unique refereed publications for the past 4 years (Figure 8).
Figure 8. Unique refereed publications by BAEN faculty

Enhance the undergraduate academic experience

Total undergraduate enrolment (Figure 9) increased steadily since 2008 primarily due to the robust increase in BAEN engineering enrollment (73-79% compared to 2008). The AGSM program during the same seven years remained relatively flat and oscillated between 120 and 145.

The department has been working on several fronts aiming at enhancing undergraduate student experiences through assessment processes including ABET, our curriculum program committees, and through our External Advisory Council. A number of positive changes have been implemented in recent years due to these processes, and they are discussed in the sections Undergraduate Engineering Programs Self Study Report. Some examples include, expanding our capstone experiences to 2 semester sequences in both the BAEN and AGSM programs, combining our 2 engineering degrees into one degree in 2006, adding a power hydraulics course to our curriculum, adding a two-course biological engineering sequence, and increasing the academic rigor of our AGSM program.
In 2012, as part of the TAMU’s reaffirmation of accreditation by SACS and as an outgrowth from our Academic Master Plan, TAMU formulated the Quality Enhancement Plan entitled “Aggies Commit to Learning for a Lifetime”. A major focus of that plan is to increase the intentionality of learning through student commitment to High Impact Learning Experiences (HILE). Money was allocated to the colleges by the provost to be used for funding HILE. In the Fall of 2012, in response to the COALS Action 2015 Request for Department High-Impact Learning Experiences, BAEN created a HILE plan for our undergraduates that included five High Impact Educational Practices (HIEP): Diversity and Global Learning (International experiences), Internships, Capstone Courses and Projects, Undergraduate Research and Honors Courses. COALS Action 2015 provides stipends (reapplied for annually) to the departments to fund those HIEP that we considered most important for our graduates.

As a part of BAEN’s HILE plan, the department offered REU grants to faculty-student teams to pursue a designated research project. This past academic year the department provided 9 of these grants to students across the department. The aim of REU grants is to encourage students to engage in research much earlier in their undergraduate career to help development more advanced skills and obtain a sense of what an advanced degree might entail. Ultimately, it provides another pathway for the student to interact with faculty and staff outside of the classroom and develop job related skills. Activities and achievements of the BAEN HILE program for last three years are summarized in the attached High Impact Learning Experiences Report.

The BAEN faculty places a strong emphasis on teaching and advising in the undergraduate curricula, and that priority is recognized by our students. Students are assigned an individual faculty member as an advisor, and see that advisor each semester prior to preregistration for the following semester. Our undergraduate advising process prevents students from registering for
classes in the next semester until they have discussed their potential class schedule with their advisor. This provides the opportunity to emphasize the correct sequence of courses and appropriate technical electives. Both BAEN and AGSM students follow the same advising procedures. The department head annually conducts a focus group session with graduating seniors, asking the students to list the top three assets of the BAEN program and three items that should be changed. In these sessions, the department is typically given high marks for the interactions between faculty and students, and the performance of the academic advising staff. At the same time, better faculty advising is mentioned as a need by a few AGSM students. The negative comments can be attributed to a combination of more complicated situations for students transferring into AGSM with a large number of completed hours, and faculty members who do not adequately study the materials provided to aid them in the advising process.

There are three student clubs within BAEN, plus a wide variety of clubs and associations that encourage participation of our students. BAEN clubs include the ASABE Student Branch, AGSM Student Branch, and Aggie Pullers. These clubs are very active and engage the students in a variety of meetings, functions, fund raising events, and industrial tours. The Aggie Pullers is the organization that competes in the ASABE Quarter Scale Tractor Design competition, and attracts students from both curricula, as well as from other departments. It has served very well as a design experience and team building experience. Participation by the students in the clubs is optional, and many of our students elect not to participate despite faculty encouragement in the classroom.

One emphasis of the Vision 2020 plan is the inclusion of undergraduate research (inquiry-based) experiences into the curriculum. Both BAEN and AGSM curricula include capstone course sequences that are based on open-ended, industry-posed problems. These course sequences require independent study, inquiry and solution development by the students. Neither the BAEN nor the AGSM curricula require a formal laboratory research experience. However, adequate opportunities exist for those students who are interested in research. Students who qualify based on grade point average (minimum 3.5) can participate in the University Undergraduate Research Fellows Program. This is a two semester independent research experience in the senior year that culminates in a senior honors thesis. AGSM students rarely elect to participate in this program. Typically one BAEN student per year will participate. Engineering students also have the option of participating in the Engineering Scholars Program Honors Certificate. This program places second and third year students in an environment to interact with faculty and graduate students in a research setting. Typically one BAEN student per year will participate.

All students also have the option of participating in an independent study experience. This is done through the variable credit courses AGSM 485 or BAEN 485. To participate in these courses, the student must develop a contract with a faculty advisor who will supervise the experience and grade the result. These are normally one semester experiences, and the number of students participating is variable, with typically 2-5 students per year.

Many AGSM and BAEN undergraduate students are hired by faculty to work on research projects, typically under the supervision of graduate students or technical staff. These are excellent learning experiences that provide an exposure to research planning and implementation. These work experiences are perhaps one of the best means of getting our
students excited about research and the possibility of graduate school. For example, last year 34 undergraduates were hired as student workers. The department also hires 4-5 students/semester to serve as undergraduate graders.

**Diversify and globalize the A&M community**

The department strives to attract a diverse faculty and student body. During the recruiting of faculty and graduate students, efforts are made to attract applications from under-represented groups. Because admission to Texas A&M is determined at the university level, there is relatively little the department can do regarding the admission of under-represented students. The efforts of our faculty have concentrated on exposing the undergraduate students to experiences that would broaden their global vision.

The department encourages undergraduate students to participate in a study abroad program at the Katholieke University in Leuven, Belgium, the TAMU-Mexico Student Exchange program, or other international experience. The department offers two study abroad courses at the Katholieke University in Leuven, Belgium every summer. The courses are open to all university students meeting the prerequisites.

Our undergraduate students have been very active in an exchange program with the University of Guanajuato in Mexico. Every fall semester, 8-10 students plus 2-3 professors come from Mexico to visit us, and this function is hosted and organized primarily by the students. During spring or summer, 5-8 A&M students travel to Guanajuato for a week long cultural and education exchange at our counterpart university in Mexico. Texas A&M students stay in host homes gaining experience in understanding how Mexican students live and work. During that same week, students attend industry tours around the Guanajuato region. Results over the past four years indicate that about 54% of our graduates have an international experience.

**Departmental Benchmarks**

The department uses a range of resources to evaluate our performance and relative ranking in comparison to our peers. These include

- Rankings provided by external entities such as US News and World Report’s ranking of undergraduate and graduate programs,
- Comparison to peer departments in statistical comparisons tabulated by the department heads of Biological and Agricultural Engineering departments across the country,
- Evaluation and feedback from our External Advisory Council and
- Surveys of our graduating students.

Details on the results of these benchmark efforts are provided in the separate reports on the graduate and undergraduate programs. Benchmarks on research productivity are included in the Graduate Program Self-Study report.
Recommendations made in last Academic Program Review

The previous Academic Program Review was conducted in 2007, and several recommendations were made by that review team. Following is a listing of those suggestions and the department’s response over the years since that review.

1. The department should identify promising domains and direct its future investments accordingly.

The department’s efforts to identify domains of emphasis are best described in the 2014-19 Strategic Plan. That document describes the priority areas of Texas A&M University, the Colleges of Engineering and Agriculture and Life Sciences, as well as the relationship of our programs to those. The department continues to emphasize its traditional strengths, particularly in water engineering, but has also made two critical hires to add expertise in nanotechnology with applications to renewable energy, food safety and biosensors. Another recent hire has taken the lead within the university to develop a multi-disciplinary team that is addressing the Water/Energy/Food Nexus, a topic that is particularly important in Texas.

2. The department should aggressively engage with other units on campus to pursue opportunities in University-wide new initiatives such as life sciences and emerging technology and economic development.

The department has numerous ongoing collaborations across the university, particularly within the Agriculture & Life Sciences and Engineering colleges. BAEN faculty are participating in the Grand Challenge areas identified at the university and college levels. In partnering with Chemical Engineering, Biomedical Engineering, and Industrial and Systems Engineering, BAEN courses are included in the certificate program in Therapeutic Manufacturing that is offered by the College of Engineering. The Water/Energy/Food Nexus effort is an example of not only engagement, but leadership in this initiative.

3. The department needs to enter into considerable discussion as a faculty to determine what biological engineering means at Texas A&M University. They should move quickly to develop a faculty staffing plan to target opportunities created by future vacancies. If possible, they should consider stacking (pre-filling) faculty positions.

Please refer to response under recommendation 1 above. Within the biological engineering scope, BAEN has decided to emphasize traditional biochemical and microbiological engineering expertise to address needs in the natural resource and bioprocessing areas. Because of existing program and expertise in other departments, BAEN has determined that biomedical applications is not an appropriate focus. The department has experienced little faculty turnover since the last review, and the current college level strategy for handling open faculty positions (90% of salary returns to the college and any new or replacement positions must be requested from the Dean) makes pre-filling faculty positions difficult.

4. The department should investigate their desired strengths in applying engineering to solving problems involving biological processes, as well as developing fundamental sciences for
advancing biological engineering as a discipline. One approach is to systematically identify the problem domains (i.e., the areas in which the department can make impacts) and required core competencies for solving the problems.

The department has continually addressed the future with regard to sub-disciplines with an emphasis on the biological component of the program. The department has added more biological content to the engineering portion of the program by creating BAEN 302, a required course on the fundamentals of Biological Engineering and adding biological engineering content in other courses, and has hired two faculty members in the area of nanoscale biological engineering with a focus on applications in food engineering, bioenergy, and biosensors. An example of research activity in an area where our faculty have made an impact has been the development of GIS-based software for assessing bacterial loading sources in impaired watershed. That software has been adopted by multiple state agencies today for targeting BMP recommendations to landowners. That software was successfully used in a project that resulted in the first watershed in the state being removed from the EPA impaired watershed list.

5. The department should explore the possibility of refocusing the Master of Engineering degree towards an emphasis on engineering design. This would support Vision 2020 imperative 5, "Build on the tradition of professional education," and potentially further enhance contact with industry.

The Master of Engineering has not been refocused as suggested. However, it has been used as a vehicle for providing graduate level education at a distance for food industry employees interested in an advanced degree. All of the graduate food engineering courses have been offered in both on-campus and distance sections for the last two years. One graduate has been produced, and the numbers enrolled at a distance are growing, but still small. The department has made the commitment to support this program for multiple years to allow for the growth time. The most successful distance education program in the College of Engineering is in Petroleum Engineering, and they state that 6-8 years were needed to grow to a critical mass. Our food engineering faculty have been working directly with PETE faculty to learn and to access their advance distance teaching facilities.

6. Increasing the size of the graduate enrollment to 60-70 should be achievable. However, this can only be accomplished with an increase in external funding.

As discussed above (Figure 7), graduate student numbers increased steadily from 55 in 2008 to 86 in 2013. Current enrollment (Fall 2014) is 94.

7. Creating a Master of Science in AGSM appears to have benefits. This graduate program could potentially increase faculty buy-in to the AGSM program. The proposal should be strengthened by seeking input from the Department's external advisory council and the industry.

A M.S. in AGSM was created with both thesis and non-thesis options. This has allowed those high performing AGSM B.S. graduates who wanted an advance research-based degree to have that option. The degree has been in place for three years, and the numbers enrolled are growing,
but still modest. The availability of the non-thesis M.S. in AGSM has provided a vehicle for our
food engineers to offer the distance degree for non-engineers in the food industry.

8. The department should consider making their graduate admission requirements more flexible
to allow non-traditional students to apply. This may serve to achieve the goal of increasing the
size, and diversity of the graduate program.

This recommendation was specifically addressing the department’s long standing practice of not
granting graduate level engineering degrees to individuals who would not be qualified for
professional engineering registration. The faculty have not substantially changed that position.
However, alternatives are available for many non-engineering students who wish to work with
our faculty. The Water Management and Hydrologic Sciences program is available, and most of
our natural resource engineering faculty have advised students pursuing M.S. and Ph.Ds. in that
major. As mentioned above, the M.S. in AGSM has provided a vehicle for those interested in
food technology, as is the Food Science and Nutrition program for on-campus students.

9. We encourage the Graduate Program and Recruiting Committee to develop an aggressive
strategic plan to broaden enrollment from diverse geographical areas, particularly with regard
to domestic students. High number of student from Texas A&M and from Texas is not a sign of a
progressive graduate program.

As of last Fall 2014, graduate student population is distributed evenly between international and
domestic students. Of the domestic students, approximately 40% belong to minority ethnicities
(African American and Hispanic); 40% of total graduate student are females. However, the
department still struggles to attract sufficient numbers of domestic students from beyond Texas.
Particularly at the M.S. level, students with a B.S. from Texas A&M predominate. For the
Spring 2015 semester, we have 53 M.S. students, with 23 holding TAMU B.S. degrees, 19
internationals and 11 non-TAMU domestic students.

10. Although it is preferable to receive additional resources for solving the graduate student
number and diversity problems, the department can start addressing the diversity issue by using
existing resources.

The BAEN faculty have addressed the issue of graduate student numbers through a variety of
mechanisms. Graduate student data show a significant increase in the number of self-funded
students. The establishment of the BAEN Graduate Scholarships has allowed non-Texan
students who are self-supporting to significantly reduce their financial burden. The faculty have
taken advantage of programs such as Brazil’s Science without Borders to increase their graduate
student numbers while limiting the cost of hosting those students.

11. We recommend that the department actively participate in advancing imperatives 5, 9 and
12 in the Vision 2020 in addition to the stated 1, 2, 3, and 6.

Imperatives 5, 9 and 12 are the following.

5. Build on the tradition of professional education
9. Build community and metropolitan connections
12. Meet our commitment to Texas

Activities toward imperative 5 were described under the fifth recommendation above. Concerning imperative 9, BAEN faculty is engaged with numerous state and local agencies through their research and outreach activities. Connections with industry are maintained both through professional contacts and the use of industry problems for the undergraduate capstone course sequences. The department addresses our commitment to Texas by focusing on issues critical to the state. Examples are participating in the College of Engineering’s growth plan that is intended to address anticipated future shortages of engineers in the state, and the water planning and conservation programs that are critical to the state’s future.

12. We recommend that the department consider changing the AGSM degree name to a more representative name, such as Technical Systems Management (TSM).

No action has been taken on this recommendation.

Strengths and Weaknesses of the Department

The BAEN department contributes positively to the overall academic environment of the university. Our department is one of the highest ranked engineering departments at Texas A&M. At the same time, we face significant challenges and have many aspects of departmental performance that we are working to improve. The contribution of BAEN to Texas A&M University was assessed using selected specific goals stated in the Vision 2020 Plan.

- **Attain an undergraduate student-to-faculty ratio equal to the median of the best public universities** – In the 2011 National ABE survey, the ten institutions that we have identified as our peer group (AAU members, USNWR rankings) had a median ratio of undergraduate students to total teaching FTEs of 28.3. Our ratio was 24.8 in the 2011 survey and 28.2 in Fall 2013. While we have been meeting this goal, it may be difficult to maintain this ratio, especially with the emphasis on growth for the university and engineering in particular. Our faculty have begun to experiment with alternative teaching methods (flipping classes, etc.) as a means of maintaining a high quality experience in larger classes.

- **Attain a faculty-student ratio of 1 to 16** – While this is a university-wide target, the ratio for our department exceeds this target.

- **Provide the resources and facilities that will allow faculty to lead the way in developing the highest quality learning environment in the classroom and laboratory** – The BAEN department is housed in two locations on campus. The majority of the faculty, most of the classrooms and a significant portion of the research laboratory space is located in Scoates Hall, a building originally constructed in 1932 and extensively renovated in 1969. We have just finished the renovation of Scoates Hall which included overhauling of the large teaching auditorium, improvements of faculty and staff offices, computer facilities and several teaching labs. Additional space that is available on West Campus
(three building) is adequate but the quality of that space is poor for conducting food/biological type of research.

Technical support of faculty research activities has been both reduced and converted from budgeted to soft funding over recent years. In the university environment, where most research is conducted through graduate students, who are transient employees, the lack of support staff to provide program continuity places that burden on the faculty. Likewise, our inability to provide proposal development assistance in the department results in the faculty spending time on time-consuming details that could be handled by others.

- **All undergraduate majors have a required research component – research across the curriculum** – This “research component” is broadly interpreted to mean an inquiry-based experience on open-ended problems. Using this definition, the capstone experiences in AGSM and BAEN meet this goal. Both currently require a two semester independent, team-oriented project posed by industry collaborators. These projects are more appropriate for all students in the majors than conventional laboratory research projects. As discussed above, those students with interest in formal research can participate in our High Impact Learning Experiences Program. Funds have been made available to faculty to support mentoring and hosting undergraduate researchers, but the participation by our faculty is less than desired. More effective methods of encouragement are needed

- **Increase the proportion of graduate students to 30 percent of the student population** – Based on Spring 2015 figures, the graduate students are 29% of the entire BAEN student population, thus, BAEN is almost on target. However, the recent shift to more doctoral students (emphasized by the university for the higher subvention rates) has resulted in a population of Ph.D. students that is dominated by internationals.

- **Recruit 75 percent of graduate students from institutions other than Texas A&M University and 50 percent from outside of Texas** – As there are no peer departments in other universities in Texas, the comparison here is TAMU students vs. outside of Texas. Over the last 7 years, the number of applications has been around 24 per year on average. Approximately 78% of the admissions in 2013 were from international students. The number of new enrolled students has reached a stable value of 8-10 students per year.

- **Have 20 percent of the student body enrolled in master’s programs** – BAEN is currently at about 11% - significantly below the desired target.

- **Seventy-five percent of lower level courses should be taught by tenured or tenure-track faculty** – The Department exceeds this target (Fall 2014 was 80%; this spring is 86%).

- **Have the majority of companies that recruit at Texas A&M rate Aggies as among their best hires** – Surveys provide evidence that this goal is met by the university as a whole. No formal survey has been requested of BAEN graduate employers, but their actions reflect a high regard for our students. Many employers repeatedly return to the department for assistance in recruiting. After the economic recovery of the last few years, the majority of students who actively interviewed prior to graduation had secured a
position. Based on survey data from the Career Center, AGSM students receive salary offers near the top of all COALS students. Starting salaries for BAEN students are average to below average for other engineering disciplines, a trait typical of the discipline.
Graduate Program Review - Self-Study Report
Department of Biological & Agricultural Engineering

Texas A&M University
201 Scoates Hall, College Station February 2015
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Introduction
Self-Study Report

DEPARTMENT OF BIOLOGICAL & AGRICULTURAL ENGINEERING

This report is a self-study by the Department of Biological & Agricultural Engineering of its graduate program. It is prepared for the purpose of a review of this program by a team of external reviewers. The Office of the Vice President for Research and the Office of the Dean of Graduate Studies at Texas A&M University have set guidelines for the review process. The program review is intended to set goals and directions for the future and ensure that general academic plans and budget decisions are based on solid information and priorities of the Vision 2020 goals.

This self-study report reflects the collective evaluation by the department faculty of the graduate program and is a part of the continuous quality improvement efforts. The report provides information, facts, statistics, etc. about the Department and about the graduate programs. It also describes the research thrusts for the growth of the Department and conducts an assessment of the needs for enhancing the Graduate Program.

The Department of Biological & Agricultural Engineering recognizes the need to continually improve its graduate program. Consequently, it looks forward to receiving feedback from the external members of the Review Team and from colleagues throughout the university.

Sandun D. Fernando
Graduate Program Chair

Stephen W. Searcy
Department Head
1.1) Current State of the Department

1.1) Faculty

The department currently has a total of 30 faculty (24 in College Station; 4 in R&E Centers, 1 in University administration and 1 on long term leave). There are 3 Regents Professors, 1 Distinguished Professor, 12 Professors, 9 Associate Professors, and 2 Assistant Professors. Three of them are appointed to Chairs, and three are appointed to Professorships (Table 1.1). The full faculty of the Department includes individuals with a majority appointment in BAEN and with an academic title of professor, associate professor, or assistant professor. Individuals with majority appointments in BAEN as Distinguished Lecturer, Senior Lecturer, Lecturer, or Professor of Practice are also members of the full faculty.

The full faculty of the Department includes individuals with a majority appointment in BAEN and with an academic title of professor, associate professor, or assistant professor. Individuals with majority appointments in BAEN as Distinguished Lecturer, Senior Lecturer, Lecturer, or professors of practice are also members of the full faculty. Other categories of membership include affiliated, collaborating, adjunct, and emeritus (Table 1.2). Table 1.3 shows the overall distribution of the Biological & Agricultural Engineering Faculty.

The biographical data of the departmental faculty members are given in Appendix A.

**Table 1.1: BAEN Faculty located in College Station (Including Depart. Head)**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tenured/Tenure-Track Faculty</strong></td>
<td></td>
</tr>
<tr>
<td>• Full Professors (including Regents and Distinguished ranks)</td>
<td>13</td>
</tr>
<tr>
<td>• Associate Professors</td>
<td>6</td>
</tr>
<tr>
<td>• Assistant Professors</td>
<td>2</td>
</tr>
<tr>
<td><strong>Non-Tenure Track (Extension) Faculty</strong></td>
<td></td>
</tr>
<tr>
<td>• Full Professors</td>
<td>3</td>
</tr>
<tr>
<td>• Associate Professor</td>
<td>3</td>
</tr>
<tr>
<td>Instructional Associate Professor</td>
<td>1</td>
</tr>
<tr>
<td>Assistant Professor of Practice</td>
<td>1</td>
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<tr>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Faculty</strong></td>
<td>30</td>
</tr>
<tr>
<td>Category</td>
<td>Home Department*</td>
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<tr>
<td>--------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Full</td>
<td>Yes</td>
</tr>
<tr>
<td>Affiliated</td>
<td>Yes</td>
</tr>
<tr>
<td>Collaborating</td>
<td>No</td>
</tr>
<tr>
<td>Adjunct</td>
<td>No</td>
</tr>
</tbody>
</table>

*Faculty who have BAEN as the home department have their promotion and tenure reviews conducted by the BAEN P&T Committee, and they may serve on the BAEN P&T committee.
### Table 1.3 Biological and Agricultural Engineering Faculty
(includes both on-campus and off-campus faculty)

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Affiliated Faculty‡</th>
<th>Adjunct Faculty</th>
<th>Emeritus Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auvermann, Brent*</td>
<td>Ale, Srinivasulu*</td>
<td>Arnold, Jeffrey</td>
<td>Coble, Charlie</td>
</tr>
<tr>
<td>Castell, Elena</td>
<td>Casey, Kenneth*</td>
<td>Braudeau, Erik</td>
<td>Darcey, Chester</td>
</tr>
<tr>
<td>Capareda, Sergio</td>
<td>Dugas, Bill**</td>
<td>Colaizzi, Paul</td>
<td>Engler, Cady</td>
</tr>
<tr>
<td>Faulkner, Brock</td>
<td>Enciso, Juan*</td>
<td>DeOtto, Robert</td>
<td>Gilley, James</td>
</tr>
<tr>
<td>Fernando, Sandun</td>
<td>Jeong, Jaehak*</td>
<td>Fritz, Bradley</td>
<td>Hiler, Edward</td>
</tr>
<tr>
<td>Fipps, Guy</td>
<td>Sheng, Zhuping*</td>
<td>Ge, Yufeng</td>
<td>Keese, Wayne</td>
</tr>
<tr>
<td>Gomes, Gomes</td>
<td>Srinivasan, Raghavan ‡‡</td>
<td>Gowda, Prasanna</td>
<td>Kunze, Otto</td>
</tr>
<tr>
<td>Huang, Yongheng</td>
<td>Sweeten, John**</td>
<td>Harmel, Daren</td>
<td>LePori, Wayne</td>
</tr>
<tr>
<td>Jaber, Fouad*</td>
<td></td>
<td>Hoffmann, Clint</td>
<td>McFarland, Joe</td>
</tr>
<tr>
<td>Jantrania, Anish *</td>
<td></td>
<td>Howell, Terry A., Sr.</td>
<td>O’Neal, Henry</td>
</tr>
<tr>
<td>Karthikeyan, R.</td>
<td>Huang, Yanbo</td>
<td>Reddell, Donald</td>
<td></td>
</tr>
<tr>
<td>Kenimer, Ann **</td>
<td>Ines, Amor</td>
<td>Stout, Bill</td>
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</tr>
<tr>
<td>Kingman, Douglas</td>
<td>Lan, Yunbin</td>
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<tr>
<td>Lacey, Ron</td>
<td>Narasimhan, Balaji</td>
<td></td>
<td>Sweat, Vincent</td>
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<tr>
<td>McGee, Russell</td>
<td>Parker, David</td>
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<tr>
<td>Mohanty, Binayak</td>
<td>Rao, Mohan</td>
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<tr>
<td>Mohtar, Rabi</td>
<td>Sui, Ruixiu</td>
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<tr>
<td>Moreira, Rosana</td>
<td>White, Michael</td>
<td></td>
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<tr>
<td>Mukhtar, Saqib</td>
<td>Yang, Changhai</td>
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<tr>
<td>Munster, Clyde</td>
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<tr>
<td>Nikolov, Zivko</td>
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<td></td>
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<tr>
<td>Parnell, Calvin</td>
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<tr>
<td>Porter, Dana*</td>
<td></td>
<td></td>
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<tr>
<td>Riskowski, Gerald</td>
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<td></td>
<td></td>
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<tr>
<td>Searcy, Stephen†</td>
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<td></td>
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<tr>
<td>Shaw, Bryan***</td>
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<tr>
<td>Singh, Vijay</td>
<td></td>
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<tr>
<td>Smith, Patricia</td>
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<tr>
<td>Stark, Greg</td>
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<tr>
<td>Thomasson, Alex</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

* Department Head

† Located at Research & Extension Center

** Administrator

*** On Leave

‡ Affiliated faculty are primarily research appointments at Research & Extension Centers with 0% or minority appointment to BAEN. BAEN is their disciplinary home.

‡‡ Joint appointment with Ecosystem Sciences & Management Department
1.1.1) Faculty Groups

Currently there are five programmatic faculty groups: Soil and Water, Post-Harvest Processing/Food Engineering/Bioprocess Engineering, Renewable Energy, Power and Machinery, and Structures and Environment. Table 1.4 shows the distribution of faculty related to each group.

<table>
<thead>
<tr>
<th>Soil and Water</th>
<th>Post-Harvest Processing/Food Engineering/Bioprocess Engineering</th>
<th>Renewable Energy</th>
<th>Power and Machinery</th>
<th>Structures and Environment</th>
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</thead>
<tbody>
<tr>
<td>G. Fipps</td>
<td>R. Lacey</td>
<td>S. Capareda</td>
<td>A. Thomasson</td>
<td>S. Mukhtar</td>
</tr>
<tr>
<td>J. Gilley</td>
<td>E. Castell-Perez</td>
<td>S. Fernando</td>
<td>S. Searcy</td>
<td>C. Parnell</td>
</tr>
<tr>
<td>Y. Huang</td>
<td>C. Engler</td>
<td></td>
<td></td>
<td>G. Riskowski</td>
</tr>
<tr>
<td>R. Karthikeyan</td>
<td>R. Moreira</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Kenimer</td>
<td>Z. Nikolov</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Mohanty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. Mohtar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Munster</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.P. Singh</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>P. Smith</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1.2) Research Centers

Center for Agricultural Air Quality Engineering and Science (CAAQES)
(Director: Ron Lacey (BAEN); Associate Director: Russell McGee (BAEN))

Established in 2002 to address the emerging issues related to air quality resulting from agricultural and rural operations. The mission of the CAAQES is to provide the research, technology transfer, and educational programs that will result in appropriate regulation of agricultural operations, rapid adoption of new air pollution abatement technology, as well as increase the number of graduates pursuing careers in environmental air quality fields.
1.3) Facilities and Laboratories

BAEN is responsible for around 31,200 ft\(^2\) of space in Scoates Hall, 19,000 ft\(^2\) in the Hobgood Building, 17,000 ft\(^2\) in the AEPM Building, and 7,200 ft\(^2\) in the fabrication shop.

1.3.1) Space Related to our Teaching Mission:

BAEN has several available classrooms, three are controlled by the department and three are controlled by the university. Scoates 208 (117 seats), 215 (35 seats), and 216 (36 seats) are ADA compliant university-controlled classrooms equipped with computers, video projection, and switching equipment. Scoates 317 (50 seats) is a general-purpose departmentally controlled educational lab used primarily for lectures and team activities. Agricultural Engineering Power and Machinery (AEPM) 203 (72 seats) and AEPM 104 (45 seats) are classrooms controlled by the department located on west campus.

Mechatronics and Controls Laboratory (Scoates 318)

This 935 ft\(^2\) room is dedicated to teaching electronics, mechatronics, controls, and electricity courses. There are twelve workstations equipped with computers. This laboratory was renovated in 2014 to upgrade workstation furniture and computers as well as electronics equipment.

Food Engineering Laboratory (Scoates 316)

This room is dedicated for teaching food and bio-process engineering. Pertinent equipment in this laboratory include a concentric tube heat exchanger, HTSH pasteurizer, freeze dryer, tray dryer, pasteurizer, scales, and digital hygrometers.

Small Engines Teaching Laboratory (AEPM 108, 108a)

This 4,440 ft\(^2\) laboratory is used primarily by our AGSM students. It has twelve workstations and can handle 24 students at a time. Each workstation has a 5.5-hp overhead valve engine plus a tool set.
Student Computer Laboratory (Scoates 214)

This 1,300 ft² room has 24 computers and a laser printer. This lab is dedicated to teaching undergraduate courses that use computers and software, and for student use in completing class assignments. An instructor's console and digital projector are installed for teaching computer-intensive classes or laboratories. This room has card access and is available to departmental undergraduate students 24 h/day, 7 days/wk. Most of Scoates is also wireless accessible for students with laptops and wireless adaptor cards.

Biological and Agricultural Engineering Teaching Laboratory (SCTS 237)

Biological and Agricultural Engineering Laboratory (SCTS 237) is a newly renovated lab used for undergraduate teaching and research in biological engineering. This laboratory is BSL-1 certified to work with BSL level 1 microorganisms. Currently laboratory sections of BAEN 301, 302, 354, BAEN 414, and AGSM 315 are taught in this lab. This laboratory is a wet lab equipped with laminar flow and fume hood, centrifuge, incubator, autoclave, muffle furnace, reactors, distillation apparatus, and multimedia projector.

1.3.2) Research Laboratories and Equipment

Biological Material Properties Laboratory (Scoates 144)

Research activities include characterization of food, agricultural and biological materials for improved functionality, rheology of biopolymeric solutions, properties of packaging materials, and shelf-life studies. Pertinent equipment in the laboratory include a pycnometer for density of granular materials, moisture content and water-activity meters, colorimeter, texture analyzers, differential scanning calorimeter, headspace analyzer, centrifuge, tensiometer thermal conductivity and diffusivity unit, , Brookfield viscometers, capillary viscometers, a falling ball viscometer, and a controlled stress rheometer.

Student Computer Laboratory (Scoates 213)

This 570 ft² room has 14 computers, laser printer and plotter. This lab is dedicated to teaching graduate and undergraduate courses that use computers and software, and for student use in completing assignments. This room has card access and is available to departmental students 24 h/day, 7 days/wk.
Hobgood Computer Laboratory (Hobgood 118)

This 375 ft² room has 12 computers and is used primarily by graduate and undergraduate students to complete assignments.

Soil & Water Properties Laboratory (Scoates 141)

This laboratory is used for research on soil-water interactions and transport of water and contaminants through soil and other porous media. State-of-the-art soil physical and hydraulic property measurement devices such as disc infiltrometers, soil water monitoring devices including theta probes, mini coil TDR probes, standard TDR probes, TDR100s; platinum electrodes for Eh measurement, reference electrodes, mercury drop electrodes, soil water pressure monitoring devices such as standard and mini tensiometers with pressure transducers; soil temperature sensors, multiplexers, data loggers, pumps, fraction collector, and automated data collection software. This lab also have saturated and unsaturated soil hydraulic property measurement devices including constant head permeameters, Tempe cells, and pressure plates for soil water retention, soil textural analysis setup, and data Sonde water quality meters.

Pedostructure Characterization Lab

The Pedostructure (the soil medium organization as an assembly of primary aggregates) characterization laboratory is the first of its kind to be established in the United States of America. The Pedostructure Lab’s specific interest lies in soil water systems (green water in the soil medium), an exceptionally important, but very under-appreciated aspect of food production. The Texas A&M Nexus team offers a precise accounting for Green Water by characterizing the soil-water system and the aspects of its thermodynamic equilibrium. This accounting will significantly assist in our understanding of the long term impact of agro environmental practices (irrigating with treated waste water, etc.) as it helps us to understand and hence protect the health of the soil water system in a quantitative fashion. A key apparatus in the lab is Typosoil®. It provides sets of continuous and simultaneous measurements of the three state variables in a soil-water system: water content, potential and specific volume. Moreover, it is able to make measurements for 8 soil samples at once. These accurate, continuous, and simultaneous measurements enable the construction of the two fundamental soil-water characteristic curves: The water retention curve (water content vs. potential) and the soil shrinkage curve (water content vs. specific volume). Those curves once adjust to the theoretical thermodynamic equations, a set of hydro-structural parameters can be obtained, each of which
characterize a specific physical properties of the soil-water medium organization and functioning. Those physical "measureable" parameters allow us to track and predict the changes in the soil behavior under different anthropogenic practices, which is considered a grand challenge nowadays.

**Nanoscale Food Engineering Laboratory (Scoates 219)**

The Nanoscale Food Engineering lab develops nanomaterials for food safety and quality applications. Both fundamental and more immediately applied research in functional delivery system and biosensor technologies in the areas of food safety, shelf-life extension of food products, and nutrient bioavailability related research are pursued. We are currently working on the design of colloidal dispersions (nanoemulsions, nanoparticles) for controlled release of active compounds (i.e., antimicrobials, antioxidants, and other nutraceuticals) in food systems and electrochemical biosensors for real-time foodborne pathogen detection.

The Nanoscale Food lab is equipped with all standard microbiology analysis equipment (autoclave, incubators, biosafety cabinet, -80°C freezer, centrifuge, UV spectrophotometer, water bath) and it is BL2 certified (biosafety level 2) to work with foodborne pathogens (i.e.; *Salmonella*, *Escherichia coli*, *Staphylococcus*, and *Listeria*). It is also equipped with homogenizer, membrane filtration, rota-evaporator, spin-coater, and freeze-dryer for nanomaterial synthesis and electrochemical potentiostat apparatus for biosensors design and characterization.

**Nanoscale Biological Systems Laboratory (Scoates 147)**

The primary focus of the Nanoscale Biological Engineering Laboratory is to understand how molecules of biological origin interact with surfaces and interfaces. Bio-based molecules highly active as a result of the presence of oxygen, nitrogen and sulfur containing functional groups. This "excessive" chemical functionality makes using these molecules in reactions that occur on surfaces quite challenging to control. Understanding these interactions will help us better engineer these systems to develop more effective applied systems.

The research problems the laboratory tackles have a direct impact on catalysis and transport phenomena. The applications range from producing sustainable energy, generating power and separation of biomolecules. We have active research projects in heterogeneous catalysis for dehydrogenation...
(hydrogen production from biobased oxygenates), deoxygenation (hydrocarbons production from biomass based oxygenates), transesterification (biodiesel production from algae), electrochemistry (charge transport in enzymatic fuel cell electrodes) and extraction (algal oil separation).

The Nanoscale Biological Engineering Laboratory is equipped with state of the art analytical instruments including an Atomic Force Microscope, Pyroprobe-coupled GCMS, Particle/zeta sizer, FTIR, UV-Vis spectrometer, GC, HPLC, TGA, and various reactors (high pressure hydrothermal reactor, continuous reactor, ultrasonic reactor and a high pressure homogenizer).

Bioseparations Laboratory (212 Borlaug Center)

Bioseparations Lab is used for transformative research in bioprocess engineering aimed at development of novel and cost-effective strategies for extraction and purification of recombinant and native biomolecules. Research focuses on bioprocesses for production and separation of industrial enzymes, therapeutic proteins, and other high-value bioproduced produced by Bioseparations lab has expertise in downstream process design and simulations related to manufacturing of biologics.

Bioprocessing and separation-related equipment include homogenizer, refrigerated high speed centrifuge, UV spectrophotometer, AKTA Purifier, HPLC w/ diode array detector, Molecular Devices plate reader, electrophoreses and blotting apparatus, three membrane systems for bench and pilot-scale filtration, pilot-scale membrane adsorbers, and variety of peristaltic pumps.

Food Engineering Laboratory (Scoates 314)

This laboratory (314) is used for research on basic food processing methods such as the vacuum frying system shown. Food processing research involves engineering and science applied to the optimization and design of food processing systems. Areas of focus include: modeling and automatic control of systems such as deep-fat frying, vacuum frying, vacuum impregnation, impingement drying, and dehydration, development of nanomaterials for nutrient delivery and other applications, and product testing.

Agricultural Air Quality Center Laboratory (Scoates 324)

The Agricultural Air Quality Center Laboratory is one of the primary labs used for research done by CAAQES. Some of the research goals include determining scientifically based particulate mass and gas emissions from agricultural
facilities and processes, and evaluation of mitigation practices. This laboratory has two Coulter Counter Multisizers and a Malvern Mastersizer for particle size distributions and counts, a variety of particle samplers, a gas chromatograph, and mobile instrumentation laboratories for field measurements. The laboratory is also equipped with one of two wind tunnels belonging to CAAQES that are capable of meeting ambient particulate matter sampler testing requirements specified by EPA in 40 CFR Part 53, of which there are only a handful in the world.

**Biochemical Engineering Laboratory (Hobgood 108)**

Biochemical Engineering Laboratory in Biological and Agricultural Engineering Department equipped with sterile laminar flow hood (bio-safety level II), analytical balance, water bath, vacuum manifold and pump assembly to extract for microorganisms, autoclave, bench top incubator, freezer, refrigerator, light and fluorescence microscope, temperature controlled centrifuge, horizontal and reciprocal shaker, gel electrophoresis systems, laboratory-scale bioreactors/fermenters, pH and EC meter, and centralized deionized water system. This laboratory is BL-1 certified and fully equipped to handle environmental media.

**Bio-Energy Testing and Analysis Laboratory (BETA) (within Hobgood 109)**

The focus of this lab is to evaluate engine performance (torque, brake horsepower, specific fuel consumption vs speed) with various biofuels and blends including complete exhaust emissions testing (CO, NOx, SOx, VOC, PM, etc). Engine performance testing and characterization of biofuels (biodiesel, ethanol and syngas) follow ASTM and SAE procedures. The lab has two engine dynamometer test beds capable of testing up to 450 hp engines. The laboratory also has a mobile fluidized bed gasifier available for testing numerous biomass feed stocks for heat and power generation. The laboratory has developed a laboratory scale biodiesel and ethanol production facilities.

**Flexible Laboratory (Hobgood 109)**

The remainder of this laboratory is used for research on machine systems, energy systems, and water engineering.

**Water Quality Laboratory (within Hobgood 110)**

This lab has a variety of equipment for analyzing water quality and wastewater.
This laboratory facilitates research on classical microbiology (culturing, enumeration, and isolation of soil and water microorganisms) and microbial ecology.

**Flexible Laboratory (Hobgood 110)**

The remainder of this laboratory is used as a staging area for water engineering related research projects. It also has a rainfall simulator for testing effects of a variety rainfall events on erosion, contaminant transport, etc.

**Wastewater Treatment Laboratory (Hobgood 110A and 114)**

This laboratory uses two adjacent rooms to support research on wastewater treatment technologies. It houses instrumentation for elemental analysis, with focus on heavy metals. Space for small reactor units is provided.

**Texas Food Safety Engineering Laboratory (within Hobgood 115)**

This facility has a 2 MeV Van de Graaff Accelerator that can generate current up to 250 µA of electrons at specific selected energies between 0.75 and 2 MeV. At the highest energy, 2 MeV, the beam power can be adjusted to 100 watts and delivered to a target area of 100 square centimeters of unit density of material, providing a dose of 1.0 kGy. Research includes food irradiation of complex shapes, use of Monte Carlo and CAT scan techniques for dose calculation, chemical phantom sensors for dose measurement, modeling of kinetics of food components during radiation, modeling of microorganisms destruction during food irradiation, smart packages and energy efficiency (pre-treatment of bio-mass for ethanol production, irradiation thermal-cracking for distillation of heavy oils).
Flexible Laboratory (Hobgood 115)

The remainder of this laboratory is used for a variety of research projects as needed. It is a large lab with space and access for large equipment such as the cotton module shown below.

Cotton Ginning Technologies Laboratory (Hobgood 116)

The Cotton Ginning Technologies Laboratory is used for studies on new techniques to maintain cotton quality in the ginning process. It also provides a service to other TAES researchers that need to have cotton samples ginned under controlled conditions in small quantities.

Particulate Matter Sampler Evaluation Wind Tunnels

Two wind tunnels are used to test and evaluate particulate matter samplers and develop methods to improve sampler performance and accuracy. With these wind tunnels we are capable of evaluating sampler performance when sampling mono-disperse of poly-disperse particulate matter over a wide range of concentrations with wind speeds ranging from 2 to 24 kilometers per hour. The tunnels are two of only a handful that meet US-EPA criteria for Particulate Matter sampler evaluation wind tunnels specified in 40 CFR Part 53.
Fabrication Shop and Courtyard

This facility is used to fabricate many of the custom research equipment designed for specific research projects. The Hobgood Complex is very important to our programs. It includes 3 buildings (Hobgood, AEPM, and fabrication shop) and a large fenced-in courtyard. The courtyard is important to our programs because it serves as a staging area for large equipment and mobile laboratories that are used for field studies. We also conduct many studies in the open area of the courtyard.

1.4) External Advisory Council (EAC) and Their Role

The Department of Biological & Agricultural Engineering’s External Advisory Council (EAC) is selected by invitation from the Department Head. Members are selected for their leadership, accomplishments, and willingness to support the mission of the Council. The advisory Council has from 6 to 12 members, who are listed below. Their primary charge is to advise the Department on practice and legislative issues that could impact the education of biological & agricultural engineers as well as agricultural system managers and to provide constructive advice on maintaining and improving the quality of our educational programs. The BAEN-EAC faces the responsibility of providing guidance on educational issues presently impacting the practice of biological & agricultural engineering and agricultural system management and issues that are important to maintaining a nationally recognized program while developing its strengths and uniqueness.

The EAC meets twice a year; in the fall, usually a conference call, and in the spring. Appointment on the EAC is by invitation for a two-year term.
Table 1.4: External Advisory Council Members - 2014

<table>
<thead>
<tr>
<th>Ashish Anand, Sr.</th>
<th>Bill Norman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Manager R&amp;D Strategy and Portfolio Transformation</td>
<td>VP Technical Sales</td>
</tr>
<tr>
<td>Frito Lay, Inc.</td>
<td>National Cotton Council</td>
</tr>
<tr>
<td>7701 Legacy Drive</td>
<td>7193 Goodlett Farms Parkway</td>
</tr>
<tr>
<td>Plano, Texas 75024</td>
<td>Cordova, Tennessee 38016</td>
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<table>
<thead>
<tr>
<th>Brian Berry</th>
<th>Russell Persyn</th>
</tr>
</thead>
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<tr>
<td>President / CEO</td>
<td>Manager, Watershed Engineering</td>
</tr>
<tr>
<td>MedTech Construction</td>
<td>San Antonio River Authority</td>
</tr>
<tr>
<td>P.O. Box 2497</td>
<td>600 E. Euclid Avenue</td>
</tr>
<tr>
<td>Rockwall, Texas 75087</td>
<td>San Antonio, Texas 78204</td>
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<table>
<thead>
<tr>
<th>Chris Hundley</th>
<th>Mike Snow</th>
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<tbody>
<tr>
<td>Global Equipment Operations Lead</td>
<td>Vice President, Industrial Management</td>
</tr>
<tr>
<td>Monsanto Company</td>
<td>Bunge North America</td>
</tr>
<tr>
<td>700 Chesterfield Parkway W.</td>
<td>11720 Borman Drive</td>
</tr>
<tr>
<td>Chesterfield, Missouri 63017</td>
<td>St. Louis, Missouri 63146-1000</td>
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<table>
<thead>
<tr>
<th>Richard A Hyde</th>
<th>Steve Stuchly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deputy Executive Director</td>
<td>Global Business Development Manager</td>
</tr>
<tr>
<td>Texas Commission of Environmental Quality</td>
<td>Halliburton</td>
</tr>
<tr>
<td>P.O. Box 13087, MC - 109</td>
<td>10200 Belaire Blvd</td>
</tr>
<tr>
<td>Austin, Texas 78711-3087</td>
<td>Houston, Texas 77072-5206</td>
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<table>
<thead>
<tr>
<th>Steve Walthour</th>
<th>William E. West, Jr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Manager</td>
<td>General Manager</td>
</tr>
<tr>
<td>Northplains Groundwater Conservation District</td>
<td>Guadalupe-Blanco River Authority</td>
</tr>
<tr>
<td>603 E 1st Street</td>
<td>933 E. Court Street</td>
</tr>
<tr>
<td>Dumas, Texas 79029</td>
<td>Seguin, Texas 78155</td>
</tr>
</tbody>
</table>
2. Graduate Programs

OGAPS, Admissions, Degrees

BIOLOGICAL & AGRICULTURAL ENGINEERING DEPARTMENT

2.1) The Office of Graduate and Professional Studies

The Office of Graduate and Professional Studies (OGAPS) is responsible for administering the graduate program for the University. The OGAPS maintains official records of each graduate student, and in this role, serves as the primary administrative body and overarching source of information for graduate education. Once a graduate student is accepted by an academic department or college, OGAPS facilitates progression towards completion of a graduate degree through maintenance of all official documents. Clearance for graduation, including final review of theses and dissertations, when required, is performed by OGAPS. The Registrar's Office is responsible for issuing all transcripts.

Additionally, the OGAPS is responsible for administering the Graduate Faculty. The Graduate Faculty consists of the President, the Executive Vice President and Provost, the Associate Provost, the Dean of the Office of Graduate Studies, the Dean of all Colleges, selected Directors, and academic group appointed by the OGAPS. Members of the Graduate Faculty participate in the graduate degree programs of the University by serving on student advisory committees and teaching graduate courses. Individuals, regardless of rank, who are not members of the Graduate faculty of Texas A&M University may not teach graduate courses or serve on student advisory committees unless special approval is granted by the Office of Graduate Studies.

The Department Head initiates nominations for membership on the Graduate faculty. The Graduate faculty is composed of Members, Associate Members, Adjunct Members, and Special Appointments. Members and Associate Members are selected from qualified individuals of the academic staff of Texas A&M University, from staff of other parts of the University, from the Texas A&M University System, and from affiliated research organizations located in College Station. The Adjunct Member classification is used for recognized scholars who do not hold a permanent appointment to the faculty of the University, but who otherwise meet the basic requirements for the status of Member. Special Appointments are temporary appointments to the Graduate faculty that allow for the teaching of a single graduate course or for membership on a specific student’s advisory committee (Table 2.1). Departmental graduate faculty and their respective ranks are given in Table 2.2.
### Table 2.1: Graduate Faculty Membership Descriptions as of Fall 2014

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member</td>
<td>Tenure track and tenured faculty members of Texas A&amp;M University, non-tenure track individuals with professorial rank in engineering and employed by Texas A&amp;M University at Qatar, or non-tenure track individuals employed by TAMU, Texas AgriLife Research or Extension, TEES, TEEX, or TTI with professorial rank; who hold the highest earned degree common to that person’s discipline, with a sufficient record of scholarly achievement.</td>
</tr>
<tr>
<td>Associate Member</td>
<td>Any TAMU faculty member (as permitted by the department or college’s policy) or professional staff employed by TAMU, Texas AgriLife Research or Extension, TEES, TEEX, TTI, or employees of federal and state agencies located in the College Station area; who hold the highest earned degree common to that person’s discipline; and with a sufficient record of scholarly achievement.</td>
</tr>
<tr>
<td>Adjunct Member</td>
<td>Recognized scholars who do not hold a permanent appointment to the faculty (including visiting and adjunct academic appointments) of this University, but who otherwise meet the basic requirements for the status of Member of the Graduate Faculty.</td>
</tr>
<tr>
<td>Special Appointment</td>
<td>Recognized scholars appointed to serve on a student’s Advisory Committee or to teach a graduate course without being permanently on the Graduate Faculty. A qualified individual employed by another university, the government or in industry that holds Special Appointment status and who serves on a Graduate Advisory Committee is not counted toward the minimum number of graduate faculty necessary to form the committee. The nominating unit must provide below the name and UIN of the one specified student’s advisory committee or the information for the specified teaching assignments and the length of time (e.g., for one semester or one or two years) for that specified teaching assignments.</td>
</tr>
</tbody>
</table>

### Table 2.2: BAEN Graduate Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>Name</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ale, Srinivasulu</td>
<td>Assistant Professor</td>
<td>Lan, Yubin</td>
<td>Adjunct Professor</td>
</tr>
<tr>
<td>Auvermann, Brent</td>
<td>Professor</td>
<td>Lesikar, Bruce</td>
<td>Adjunct Professor</td>
</tr>
<tr>
<td>Capareda, Sergio</td>
<td>Associate Professor</td>
<td>Mohanty, Binayak</td>
<td>Professor</td>
</tr>
<tr>
<td>Casey, Kenneth</td>
<td>Associate Professor</td>
<td>Mohtar, Rabi</td>
<td>Professor</td>
</tr>
<tr>
<td>Castell-Perez, Elena</td>
<td>Professor</td>
<td>Moreira, Rosana</td>
<td>Professor</td>
</tr>
<tr>
<td>Dugas, William</td>
<td>Professor</td>
<td>Mukhtar, Saqib</td>
<td>Professor</td>
</tr>
<tr>
<td>Enciso, Juan</td>
<td>Associate Professor</td>
<td>Munster, Clyde</td>
<td>Professor</td>
</tr>
<tr>
<td>Engler, Cady</td>
<td>Professor Emeritus</td>
<td>Nikolov, Zivko</td>
<td>Professor</td>
</tr>
<tr>
<td>Faulkner, Wm. Brock</td>
<td>Assistant Professor</td>
<td>Parnell, Calvin</td>
<td>Professor</td>
</tr>
</tbody>
</table>
The Department’s Graduate Program Coordinator serves as a liaison between the Office of Graduate Studies and the Department of Biological and Agricultural Engineering on graduate matters. The Graduate Program Coordinator/Chair represents the department at the Graduate Program Council (GPC) in the Colleges of Agriculture and Life Sciences and Graduate Instructional Council (GIC) of the College of Engineering. The Graduate Program Coordinator/Chair will normally act for the Department Head in certain graduate matters. Dr. Sandun D. Fernando serves as the Department Graduate Coordinator/Chair.

The Academic Advisor assists in administrative matters pertinent to graduate students. Such matters include but not limited to: administration of incoming graduate program applications, provide all students with support regarding deadlines, document completion and submission, act as a liaison between students, faculty and the Office of Graduate and Professional Studies, provide support and feedback in understanding policies that govern graduate studies at TAMU, provide data and metrics for several annual university and national reports, manage and maintain graduate space assignments, etc. The Academic advisor is also responsible for establishing and maintaining the graduate student database. Ms. Stormy Kretzschmar serves as the Graduate Academic Advisor.

### 2.2) Graduate Degrees

The Department of Biological & Agricultural Engineering offers graduate studies leading to both engineering and non-engineering degrees. Engineering degrees include Master of Science, Master of Engineering (non-thesis), and Doctor of Philosophy. In addition, the department offers courses and faculty supervision for students pursuing the Doctor of Engineering degree. The Department of Biological and Agricultural Engineering requires students pursuing an engineering degree program to have a degree from an ABET-accredited engineering program or demonstrate that courses taken in previous academic preparation are equivalent to a BS in engineering.
Non-engineering degrees, Master of Science (thesis and non-thesis options), and Master of Agriculture, in agricultural systems management is offered. These degrees are technology oriented with emphasis on systems analysis and management. The M.S. in Agriculture degree requires an internship for practical experience. Minimum preparation for entry into advanced study for non-engineering degrees would include a baccalaureate degree in agricultural systems management, food science and technology, or equivalent. Depending on degree and area of study, prerequisite courses may be required to provide the technology background.

The department offers two advanced degrees via distance education: Master of Engineering (MEng) in Biological and Agricultural Engineering and MS in Agricultural Systems Management. The MEng is designed to provide an advanced degree in food engineering to engineers working in the food and related industries. The MS degree (non-thesis Option) in Agricultural Systems Management with emphasis in Food Processing Technology is geared to those students who do not have a bachelor degree in engineering. The courses are geared to give students a firm grounding in Unit Operations in Food Processing, Food Rheology, Food Packaging, Food Safety, Engineering Properties of Foods, and Modeling and Design of a wide range of food processing systems. Graduates pursuing a MEng in Food Engineering will receive diplomas in Biological & Agricultural Engineering from TAMU with emphasis in Food Engineering. Those focusing in MS in Food Technology will receive diplomas in Agricultural Systems Management from TAMU with emphasis in Food Technology.

The faculty also participates in supervision of students pursuing Master of Science and Doctor of Philosophy degrees from interdisciplinary faculties such as food science and technology, and water.

2.2.1) The Degree of Master of Science

The degree requires 32 credit hours of coursework beyond a Bachelor of Science degree plus a thesis. The thesis must be defended in an oral presentation.

2.2.2) The Degree of Master of Engineering

The degree requires 30 credit hours of course work beyond a Bachelor of Science degree that includes a minimum of 3 credit hours of professional internship. The work in the major field includes a written report. These reports do not necessarily involve results of research conducted by the student. The degree does not require the submittal of a formal report to the University.

2.2.3) The Master of Science (Agricultural Systems Management) – Thesis Option

The degree requires 32 credit hours of coursework beyond a Bachelor of Science degree plus a thesis. The thesis must be defended in an oral presentation.
2.2.4) The Master of Science (Agricultural Systems Management) – Non-Thesis Option

The degree requires 36 credit hours of coursework beyond a Bachelor of Science degree.

2.2.5) The Master of Agriculture (Agricultural Systems Management)

The degree requires 36 credit hours beyond a Bachelor of Agriculture degree. The work in the major field requires a minimum of 3 credit hours of professional internship and a written report. These reports do not necessarily involve results of research conducted by the student. The degree does not require the submittal of a formal report to the University.

2.2.6) The Degree of Doctor of Philosophy

The degree requires a minimum of 64 credit hours beyond the Master degree and 96 credit hours beyond the Bachelor degree. The major field work requires a minimum of 24 course credit hours beyond a Master degree (minimum of 36 hours for a student enrolling into a PhD program directly from a BS). The degree requires the student to complete a preliminary examination, both written and oral, prepared and administered by the student's Advisory Committee and defend and submit a dissertation to the University.

2.2.7) The Degree of Doctor of Engineering

The degree requires a minimum of 64 credit hours beyond the Master degree. The Doctor of Engineering degree is non-research oriented and is intended to prepare the student to work at the highest levels of the engineering profession. The College of Engineering administers this degree.

2.3) Graduate Admissions

Admission is primarily the responsibility of the department. The BAEN Department requires a 3.0/4.0 GPR (on last 60 hours of B.S. when applying for M.S.), 3.00 GPR (on previous degree when applying for Ph.D.) for admission. International students are required to fulfill an English proficiency requirement which is most commonly met with a minimum score of 146 on the GRE verbal or a minimum TOEFL score of 80-iBT, 213 computer-based, or 550 paper-based. More details on requirements can be found by visiting the English Language Institute web page. If these minimum scores are not met, the international student must take an English Language Proficiency Exam. The department will not review and consider an application until it is submitted, the application fee is paid, and test scores, recommendation letters, and statement of purpose are received.

The Department of Biological & Agricultural Engineering requires students pursuing an engineering degree program to have a degree from an ABET accredited engineering program or demonstrate that courses have been taken that are equivalent to a B.S. in engineering. A student pursuing an agriculture degree must have a B.S. or equivalent in a recognized program.
Figure 2.1 shows the number of applications, admitted, and enrolled students for the past 07 years. The number of applications has been around 23-24 per year on average. In 2013, approximately 40% of the admissions were in the environmental area. Approximately 78% of the admissions in 2013 were from international students. The number of new enrolled students has reached a stable value of 8-10 students per year - approximately 25% of the total number of graduate students in the department are new students each year. The number is governed for the most part by the number of faculty in the department, the number of faculty in each discipline area, the number of students that faculty are reasonably able to supervise, and funding availability.

![Applications to Graduate Programs](chart.png)

**Figure 2.1: BAEN - Number of Graduate Applications, Admitted, and Enrolled Students in the past 5 years**

The quantitative and verbal components of the GRE scores of admitted graduate students are shown in Figure 2.2. The Department maintains high admissions standards. The GRE verbal plus quantitative score of admitted students averaged 1125 for the last five years.
Figure 2.2: Average GRE Scores of Student Admitted

Figure 2.3 below shows the demography (in percentage) of BAEN graduate student body.

Figure 2.3: 2014 BAEN Graduate Student Distribution

2.4) Departmental Graduate Committee

The graduate committee is composed of faculty members selected by the head of the department. The Graduate Committee responsibilities include evaluation of new applicants, developing new guidelines for admission and degree programs, and recruiting. The chair of the
committee is the Graduate Program Chair/Coordinator and is the Department’s Graduate representative to the College of Agriculture and Life Sciences as well as the College of Engineering.

The BAEN Graduate committee uses a Student Information Database (compiled using data available by TAMU Admissions) to evaluate new applicants on-line. Information found in the database includes: (1) GRE scores, (2) TOEFL scores, (3) Area of interest, (4) GPA, (5) GRE, (6) Previous degrees and schools, (7) Starting semester, (8) Level of study applying for (degree sought). Additional documents include (in PDF): (1) Official Admission Records (OAR), (2) Application, (3) Purpose, (4) Recommendations, (5) Resume, and (6) Transcripts.

2.4.1) Faculty Evaluation of Candidates/Selection

Once all required data of a candidate is entered in the database, the information is then made available (via a snippets document containing major credential of the student prepared by the Academic Advisor) for the faculty members of the BAEN department to evaluate. A Faculty member must inform the Chair of the Graduate committee if he/she is interested in advising any graduate student applicant. This is a requirement for an applicant to be admitted to the graduate program at the BAEN department.

2.4.2) Graduate committee evaluation

The Graduate committee members evaluate the student application and approve or deny the admission (by voting on-line). Each member of the Graduate Committee uses a scorecard to help evaluate applications (Table 2.3).

Table 2.3: Scorecard for Graduate Admissions in the BAEN department

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPR</td>
<td>0-5</td>
</tr>
<tr>
<td>Indicators of academic or scholarly potential</td>
<td>0-5</td>
</tr>
<tr>
<td>Professional experience(s)</td>
<td>0-5</td>
</tr>
<tr>
<td>Career/professional goals</td>
<td>0-5</td>
</tr>
<tr>
<td>Professional references</td>
<td>0-5</td>
</tr>
<tr>
<td>Faculty advisor/mentor identified</td>
<td>0 or 25</td>
</tr>
</tbody>
</table>

Masters level applicants must score at least 35 out of 50 points and doctoral applicants must score at least 42 to receive a positive vote from committee members. Once ALL members of the graduate committee have voted, the Chair of the Graduate Committee follows the recommendations and procedure with admissions or denials.
The department Graduate Coordinator/Chair will then sign acceptance or denial electronically (using information provided at TAMUdocs - Office of Admissions and Records). The admissions office will then send out acceptance and denial letters to applicants (once the application fee has been paid).

2.5) Financial Assistance

The BAEN department may provide financial support in the form of assistantships and fellowships. Graduate assistants are selected on the basis of previous academic performance, their ability for handling work assignments with excellence, and their potential for future performance in these areas. These are available only to graduate students who are actively pursuing graduate degree programs and who are making satisfactory progress toward their degrees.

The academic year encompasses two appointment periods: end of August to end of December and January 1 to middle May. Summer appointments cover the period from mid May to mid August. The department is responsible for informing the graduate assistant of the distribution of duties that are related to the summer appointment. Ph.D. students should be aware that financial support in the form of an assistantship will be terminated if they have enrolled in more than 100 credit hours without graduating.

The funds come from a variety of sources and the budget varies from year to year. Three types of assistantships are awarded by the department: (1) Graduate Assistant Teaching (GAT), (2) Graduate Assistant Non-Teaching (GANT), and (3) Graduate Assistant Research (GAR).

Teaching assistantships (GAT/GANT) are awarded by the Department Head in consultation with the faculty. They are awarded on a semester-by-semester basis. Teaching assignments are made based upon teaching needs and the expertise of the student. It is desirable for each Ph.D. student in the department to spend at least one semester as a teaching assistant to gain experience. However, many factors such as the number of students, availability of funds, teaching needs and student expertise may prevent some Ph.D. students from serving as teaching assistants. There are typically 11 GAT/GANT per each year. The position is half-time (20 hours/week) appointment. At present, an MS student is paid $1,488 per month and a PhD student is paid $1,688, as well as full health insurance benefits. As a GAT/GANT, the graduate student’s tuition is paid by the University.

Research assistantships (GAR) are funded through research grants and contracts in the department and are awarded with the approval of the project leader for each grant. The base line salaries of GAR are the same as those for GATs and GANTs. As a GAR, the graduate student becomes eligible for in-state tuition. The current in-state tuition is approximately $8,000 per year. The current out-of-state tuition rate is approximately $15,000.

Both GAT/GANT and GAR are required to be full-time students at Texas A&M University. To be considered a full-time student, a student must register for a minimum of nine credit hours.
during a regular (fall or spring) semester and a minimum of six credit hours during the summer semester.

Fellowships are awarded only to highly-qualified incoming graduate students. The Department nominates its top recruits to the College level (Regent Fellowship) and University level fellowship competitions (Graduate Merit Fellowship).

In recent years, the Department of Biological & Agricultural Engineering has offered $1000/year scholarships. These competitive scholarships are offered to students with no other form of financial support. Recipients of these scholarships are eligible to pay in-state tuition.

Figure 2.4 shows the number of graduate students on support. This number does not include students on scholarships. In recent years, approximately 40% of BAEN students are on financial support. Recently, BEAN have experienced a surge of self-funded students especially at the Master’s level.

![Graduate Student Support](image)

**Figure 2.4: Number of Graduate Students on Support (2007-2014)**

2.6) Graduate Student Enrollment and Retention

Figure 2.5 shows the number of graduate students enrolled in the department from 2008 to 2014. These numbers fluctuate between 60 and 90 with an average of 72 students per year during the last 07 years. The total number of students has grown steadily until 2013. Domestic graduate students are harder to get when the economy gets better and international students have been difficult to get due to recent visa issues. Another limiting factor is that few students will come in without assistantships.
In terms of retention, the one-year overall retention rate of graduate students is a healthy 88%. The PhD retention rate is above 90% over the past seven years (Figure 2.6).
Figures 2.7 and 2.8 depict the gender and ethnicity distributions of graduate students in the Department. As of Fall 2014, of the 94 graduate students approximately 40% are females. The graduate student population is distributed evenly between international and domestic students. Of the domestic students, approximately 40% belong to minority ethnicities (African American and Hispanic). Accordingly, BAEN department provides an excellent multicultural environment where students can flourish while sharing each other’s unique backgrounds and life experiences.

**Figure 2.6: BAEN - Graduate Student Retention (Last seven years)**

Figures 2.7 and 2.8 depict the gender and ethnicity distributions of graduate students in the Department. As of Fall 2014, of the 94 graduate students approximately 40% are females. The graduate student population is distributed evenly between international and domestic students. Of the domestic students, approximately 40% belong to minority ethnicities (African American and Hispanic). Accordingly, BAEN department provides an excellent multicultural environment where students can flourish while sharing each other’s unique backgrounds and life experiences.

**Figure 2.7: Graduate Student Numbers by Gender as of Fall 2014**
Figure 2.8: 2014 Graduate Student Ethnicity Distribution, Fall 2014.

Figure 2.9 demonstrates that the Biological & Agricultural Engineering department, on average, maintains higher number of graduate students in comparison to Peer-Institutions (47 vs. 33) MS and 50 vs 37 PhD). Our graduate engineering program (BAEN) is ranked periodically by the U.S. News and World Report when they conduct national rankings of all engineering programs. Our program has been consistently ranked at or near the top and was ranked #2 in the nation during most recent ranking (for last 4 years).
Figure 2.9: BAEN Graduate Enrollment Compared to Peer-Institutions (2011)

Figure 2.10 shows the number of advanced degrees awarded in the program from 2003 to 2014. During this period, 45 doctoral, 100 MS (BAEN and AGSM), 13 MEng, and 2 M. Ag. degrees were conferred. The average time to degree was 2.8 year for MS and 5.2 years for PhD (Figure 2.11).
**Number of Degrees Granted**

![Bar chart showing the number of degrees granted per academic year.](image)

**Figure 2.10: BAEN - Advanced Degrees Granted per Academic Year**

**Time to Degree**

![Bar chart showing the time to degree.](image)

**Figure 2.11: Time to Degree**
Table 2.9 provides a summary of degrees and type of initial position taken for students graduated since 2000. A large percentage of our former Ph.D. students hold academic positions at major institutions within the U.S. and around the world.

**Table 2.9: Summary of Former Graduate Students – Number of Graduates by Degree and Type of Positions after Graduation**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Industry</th>
<th>Government</th>
<th>University</th>
<th>Grad. Study</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters</td>
<td>53</td>
<td>9</td>
<td>13</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>13</td>
<td>7</td>
<td>23</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
3. Degree Requirements

M.S., M.Eng., M.Ag., and Ph.D.

BIOLOGICAL & AGRICULTURAL ENGINEERING DEPARTMENT

3.1) Goals of Graduate Education in Biological & Agricultural Engineering

**In general**

- To explore the use of science and technology in problem solving for the benefit of society
- To further career opportunities
- To participate in the process of continuous education
- To develop and enhance professionalism
- To develop leadership and management skill
- To develop communication skills, written and oral
- To develop self-discipline and self-educating capabilities

**At the Masters Level**

- To develop the capability to plan, conduct, and document research in accordance with accepted scientific methodology
- To learn to function as a member of a team or organization
- To prepare for the pursuit of further specialization or advanced degree
- To communicate research results orally and in the pertinent literature
At the Doctoral level

- To develop the capability to conduct independent research by writing proposals, planning research, conducting research, administering projects, managing support personnel, and communicating research results orally and in the pertinent literature

- To develop teaching skills through formal study of pedagogical methods, supervised classroom teaching experience, and fostering a positive attitude towards teaching

- To develop a high level of expertise in a particular subject area

- To develop new knowledge

3.2) Course Requirements for the Degree

Courses to be included on a student’s degree plan are selected as a joint effort between the student and his/her Advisory Committee. The student’s Advisory Committee and the BAEN Department Head must approve all degree plans.

3.2.1) Master of Science Degree (M.S./Thesis Option)

The Master of Science degree requires a minimum of 32 credit hours of approved courses and research. University regulations allow up to eight hours of 32 to be research hours. The research must lead to a thesis that “reflects a comprehensive understanding of the pertinent literature and expresses in clear and eligible English, the problem(s) of study, the method, significance and results of the student’s original research”. “The students must complete nine resident credit hours during one regular semester or one 10-week summer session” to meet the residency requirement. There are also other restrictions on the use of transfer credits, special topics courses, etc. The students’ program is under the direction of an Advisory Committee appointed by the Department, with approval of the University Office of Graduate Studies. This committee, including at least three faculty members in the student’s major area of study, with at least one of the members being from outside the BAEN Department, reviews the student’s degree program and thesis proposal, conduct a final oral thesis defense, and provides other direction as appropriate. Degree requirements are presented in Table 3.1. The time frame for earning the degree is two to three years.
Table 3.1: Master of Science in BAEN Degree Requirements as of Fall 2014

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 681: Seminar</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 690: Theory of Research</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 683: Peer Review Process and Publication</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 691: Research</td>
<td>***</td>
<td>8</td>
</tr>
<tr>
<td>BAEN Elective courses</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>MATH Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>STAT Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Free Electives</td>
<td>***</td>
<td>7 - 9</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

*Must choose MATH and STAT elective from approved course list. See reference list. Student can only have a maximum of 6 hours of 685 and 689 combined coursework on graduate degree plan. Maximum of 9 hours of undergraduate credit at the 300-400 level may be used on a graduate degree plan. None of the BAEN undergraduate required courses may be used on a graduate degree plan. Student may only apply a maximum of 12 hours of transfer coursework to a graduate degree plan. Final oral defense of thesis required.

3.2.2) Master of Engineering Degree (M.Eng)

The Master of Engineering degree requires a minimum of 30 semester credit hours of approved courses, with some restrictions on the use of transfer credits, special topics courses, etc. Approximately one-third of the student’s coursework is taken outside of her/ his major field of study. The student’s program is under the direction of an Advisory Committee appointed by the Department, with approval of the University Office of Graduate Studies, including at least three faculty members in the student’s major area of study and at least one faculty member from outside the BAEN Department. The student is required to pass a final examination administered by the Advisory Committee, and the practice of the Department is that this exam focuses on an oral presentation of the written report mentioned on page 2-3 (Graduate Programs). The Advisory Committee also reviews the student’s degree program and provides other direction as appropriate. Degree requirements are presented in Table 3.2. The time frame within the Department for earning the degree is one to two years.
Table 3.2: Master of Engineering in BAEN Degree Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 681: Seminar</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 684: Professional Internship</td>
<td>***</td>
<td>3 - 6</td>
</tr>
<tr>
<td>BAEN Elective courses</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>MATH Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Free Electives</td>
<td>***</td>
<td>13 - 17</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

*Must choose MATH elective from approved course list. See reference list. Student can only have a maximum of 6 hours of 685 coursework on graduate degree plan. Any combination of 684 and 685 cannot exceed 25% of total hours. Maximum of 9 hours of undergraduate credit at the 300-400 level may be used on a graduate degree plan. None of the BAEN undergraduate required courses may be used on a graduate degree plan. Student may only apply a maximum of 12 hours of transfer coursework to a graduate degree plan. Final oral examination over written internship report required.

3.2.3) Master of Science Degree (Agricultural Systems Management) Thesis and non-Thesis options

A non-engineering degree, Master of Science, in agricultural systems management requires a minimum of 32 credit hours of approved courses for thesis option and 36 credit hours for the non-thesis option. This degree is technology oriented with emphasis on systems analysis and management. The thesis option requires defending a thesis. Approximately one-third of the student’s coursework is taken outside of her/his major field of study. The student’s program is under the direction of an Advisory Committee appointed by the Department, with approval of the University Office of Graduate Studies, including at least three faculty members in the student’s major area of study and at least one faculty member from outside the BAEN Department. The student is required to pass a final examination administered by the Advisory Committee. The Advisory Committee also reviews the student’s degree program and provides other direction as appropriate. Degree requirements are presented in Tables 3.3 (thesis option) and 3.4 (non-thesis option). The timeframe within the Department for earning the degree is one to two years.
Table 3.3: Master of Science in AGSM Degree Requirements (thesis option)

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 681: Seminar</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 690: Theory of Research</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 683: Peer Review Process and Publication</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 691: Research</td>
<td>***</td>
<td>8</td>
</tr>
<tr>
<td>BAEN Elective courses</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>BAEN 601: Advanced Agricultural Systems Analysis</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>STAT Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Free Electives</td>
<td>***</td>
<td>8 - 9</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

*Must choose STAT elective from approved course list. See reference list. Student can only have a maximum of 6 hours of 685 and 689 combined coursework on graduate degree plan. Maximum of 9 hours of undergraduate credit at the 300-400 level may be used on a graduate degree plan. None of the AGSM undergraduate required courses may be used on a graduate degree plan. Student may only apply a maximum of 12 hours of transfer coursework to a graduate degree plan. Final oral defense of thesis required.

Table 3.4: Master of Science in AGSM Degree Requirements (non-thesis option)

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 681: Seminar</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN Elective courses</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>BAEN 601: Advanced Agricultural Systems Analysis</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Free Electives</td>
<td>***</td>
<td>26</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

* Student can only have a maximum of 6 hours of 685 and 689 combined coursework on graduate degree plan. Maximum of 9 hours of undergraduate credit at the 300-400 level may be used on a graduate degree plan. None of the AGSM undergraduate required courses may be used on a graduate degree plan. Student may only apply a maximum of 12 hours of transfer coursework to a graduate degree plan.

3.2.4) Doctor of Philosophy (Ph.D.)

Work leading to a Ph.D. at Texas A&M University is designed to give the candidate a thorough and comprehensive knowledge of his or her professional field and training in methods of research. The final basis for granting the degree is the candidate’s grasp of the subject matter of
a broad field of study and a demonstrated ability to do independent research. In addition, the candidate must have acquired the ability to express thoughts clearly and forcefully both orally and in writing. The degree is not granted solely for the completion of coursework, residence and technical requirements, although these requirements must be met.

The student’s program is under the direction of an Advisory Committee appointed by the Department, with approval of the University Office of Graduate Studies. The committee consists of no fewer than four members of the graduate faculty representative of the student’s several fields of study and research, where the chair or co-chair must be from the student’s department. At least one these four members must be from a department other than the student’s department.

The student’s advisory committee evaluates the student’s previous education and degree objectives. The committee consults with the student in her/his development of a degree plan and an outline of a research problem for the dissertation. The degree plan must be filed with the Office of Graduate Studies no later than 90 days prior to the preliminary examination. For a student who has completed a master’s degree, a minimum of 64 hours is required on the PhD degree plan. For a student who has completed a baccalaureate degree, but not a master’s degree, a minimum of 96 credit hours is required on the degree plan. After passing the required preliminary oral and written examination for the doctoral degree, the student must complete all remaining requirements for the degree within four calendar years.

To be admitted to candidacy for a doctoral degree in Biological & Agricultural engineering, a student must have (a) satisfied residency requirements, (b) passed the preliminary examination, (c) completed all formal coursework, and (d) filed with the Office of Graduate Studies the approved dissertation proposal. The final examination is not authorized for any doctoral student who has not been admitted to candidacy.

The student’s research proposal must be approved at a meeting of the student Advisory Committee, at which time the feasibility of the proposal research and adequacy of the available facilities are reviewed. The approved proposal is submitted to the Office of Graduate Studies at least 14 weeks prior to the close of the semester or summer session in which the student expects to receive the degree prior to the scheduling of the final examination, whichever comes first. For final approval, the narrative portion of the proposal should not exceed more than 10 pages in length, and the proposal also includes a list of the selected references.

The ability to perform independent research must be demonstrated by the dissertation, which must be the original work of the candidate. Whereas acceptance of the dissertation is based primarily on its scholarly merit, it must exhibit credible literary workmanship. Degree requirements are presented in tables 3.5 and 3.6. The time frame within the department for earning the degree is 4-5 years.
Table 3.5: Doctor of Philosophy in BAEN Degree Requirements (96 credit hour option)

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 681: Seminar</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 690: Theory of Research</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 683: Peer Review Process and Publication</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 691: Research</td>
<td>***</td>
<td>60</td>
</tr>
<tr>
<td>BAEN Elective courses</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>MATH Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>STAT Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Free Electives</td>
<td>***</td>
<td>19 - 21</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>96</td>
</tr>
</tbody>
</table>

*Must choose MATH and STAT elective from approved course list. See reference list. Student can only have a maximum of 3 hours of 685 coursework on graduate degree plan. Student must complete preliminary examination (written and oral). Final oral defense of dissertation required.

Table 3.6: Doctor of Philosophy in BAEN Degree Requirements (64 credit hour option)

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 681: Seminar</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 690: Theory of Research</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 683: Peer Review Process and Publication</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 691: Research</td>
<td>***</td>
<td>40</td>
</tr>
<tr>
<td>BAEN Elective courses</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>MATH Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>STAT Elective</td>
<td>1</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Free Electives</td>
<td>***</td>
<td>7 - 9</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>64</td>
</tr>
</tbody>
</table>

*Must choose MATH and STAT elective from approved course list. See reference list. Student can only have a maximum of 3 hours of 685 coursework on graduate degree plan. MATH and STAT requirement can be waived if student obtained a grade of B or better in an approved course while obtaining MS degree. Student must complete preliminary examination (written and oral). Final oral defense of dissertation required. Student who obtained MS degree in department and satisfactorily completed BAEN 690 does not have to retake course.
3.2.5) Doctor of Engineering (D.Eng.)

The most obvious ways in which the D.Eng. program differs from the PhD are that research experience is replaced by an internship of at least one calendar year in industry, and the dissertation is replaced by a Record of Study, which usually consists of a report on the internship experience.

The D.Eng. degree is primarily administered by the Dwight Look College of Engineering, rather than by the individual department in the College. The objective of The D.Eng. program is the education of men and women to function at the highest levels of the engineering profession, with emphasis on solving problems that arise in the use of technology to benefit mankind. The D.Eng. program seeks to couple understanding of the characteristics of social and business institutions with high competence in engineering problem solving.

The student’s program is under the direction of an Advisory Committee appointed by the College, with the approval of the University Office of graduate studies. The committee consists of no fewer than four members of the graduate faculty representative of the student’s several fields of study. At least one these four members must be from a department other than the student’s administrative department. The student’s internship supervisor, a practicing engineer, is also a member of the Advisory Committee.

The student’s Advisory Committee has the responsibility for guiding and directing the entire academic and internship program of the student and for initiating all action concerning the student. The committee responsibilities include the proposed degree program, the written and oral D.Eng. qualifying examination, the technical adequacy of the internship program, the qualification of the student to embark on the internship, the internship report, and the final examination. The graduate portion of the student’s D.Eng. degree plan must include a minimum of 96 semester credit hours, of which 80 credit hours are for coursework. The Professional Internship earns four credit hours per semester or summer term.

The internship experience is intended to be at an organizational level such that the student is able to deal with broadly based problems affecting more than one facet of the organization, rather than a single narrow or specific technical problem. The time frame with the Department to earn the degree is 3-4 years.

3.3) Doctoral Examinations

3.3.1) Preliminary Examination

Each PhD student is required to take a preliminary examination. This exam is given no later than the date at which the student is within approximately six credits hours of completion of the formal coursework on the degree plan (excluding 681 and 691) and no later than the end of the semester following the completion of this formal coursework on the degree plan. The examination is both oral and written. The written part of the examination covers the fields of study included in the student’s degree plan. Each member of the Advisory Committee is responsible for administering a written examination in his or her particular field, unless he or
she chooses to waive participation. Each written examination must be completed and reported as satisfactory to the chair of the Advisory Committee before the oral examination may be held.

The purpose of the preliminary examination is for the student’s Advisory Committee members to satisfy themselves that the student has demonstrated a master of the subject matter of all fields in the program and an adequate knowledge of the literature in these fields and an ability to carry out bibliographical research. Upon approval of the student’s Advisory Committee, with no more than one member dissenting, and the approval of the Office of Graduate studies, a student who has failed the preliminary examination is given one re-examination, when adequate time has been given to permit the student to address the inadequacies emerging from the first examination (normally six months). The student and the Advisory Committee negotiate a mutually acceptable date for this purpose.

3.3.2) Final Defense

The candidate for the doctoral degree must pass a final examination by deadline dates announced in the Office of Graduate studies calendar each semester or summer session. No student is given a final examination unless her or his current GPR is 3.00 or better and she or he has been admitted to candidacy. There must be no un-absolved grades of D, F, or U for any courses listed on the degree plan. To absolve a deficient grade, a student must have repeated the course and achieved a grade C or better. A student must have completed all coursework on his or her degree plan with the exception of any remaining 691 (Research) for which he/she is registered.

The student’s Advisory Committee, as finally constituted, conducts the final examination. The final examination for the PhD student is not administered until such time that the dissertation is available in substantially final form to the student’s Advisory Committee, and all concerned have had adequate time to review the document. Whereas the final examination may cover the broad field of the PhD candidate’s training, the major portion of the time is generally devoted to the dissertation and closely allied topics. Persons other than members of the graduate faculty may, with mutual consent of the candidate and the major professor, be invited to attend a final examination for an advanced degree. A positive vote by all members of the graduate committee with at most one dissension is required to pass a student on his or her exam. The final examination procedure for D.Eng. students is similar, but the emphasis is on the Record of Study rather than a dissertation.

3.4) Graduate Course Offerings

The department typically offers approximately nine graduate courses per semester. The Biological & Agricultural Engineering Department courses bear a BAEN prefix. Each semester our faculty offers about one to two courses in emerging areas as Special Topics in Biological & Agricultural Engineering (BAEN 689-xxx). Once a course has been successfully offered twice as a BAEN 689 class, and if the course has achieved value in the opinion of the department’s faculty, then the necessary paperwork is submitted to have the course listed in the catalog with a permanent course number.
Every student in the graduate program (both master and doctoral students) is expected to take at least two BAEN courses. A list of current courses is given in Table 3.6. In addition, all masters’ students are required to take an advanced MATH class (MATH 601 or equivalent: MATH 609, 611, 612, 647, 664, MEEN 605, CHEN 604) and an advanced statistics class (STAT 601, 652, or equivalent). Syllabi for various graduate courses are given in Appendix B.

**Table 3.6: List of Graduate Classes in the BAEN Department**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 601</td>
<td>Advanced Agricultural Systems Analysis</td>
</tr>
<tr>
<td>BAEN 614</td>
<td>Renewable Energy Conversions</td>
</tr>
<tr>
<td>BAEN 617</td>
<td>Fundamentals of Nanoscale Biological Engineering</td>
</tr>
<tr>
<td>BAEN 620</td>
<td>Food Rheology</td>
</tr>
<tr>
<td>BAEN 622</td>
<td>Unit Operations in Food Processing</td>
</tr>
<tr>
<td>BAEN 625</td>
<td>Advances in Food Process Engineering</td>
</tr>
<tr>
<td>BAEN 627</td>
<td>Engineering Aspects of Packaging</td>
</tr>
<tr>
<td>BAEN 631</td>
<td>Bioprocesses and Separations in Biotechnology</td>
</tr>
<tr>
<td>BAEN 651</td>
<td>Geographic Information System for Resources Management</td>
</tr>
<tr>
<td>BAEN 652</td>
<td>Advanced Topics in Geographic Information System</td>
</tr>
<tr>
<td>BAEN 653</td>
<td>Bioreactor Design</td>
</tr>
<tr>
<td>BAEN 661</td>
<td>Experimental Methods in Biological and Agricultural Engineering</td>
</tr>
<tr>
<td>BAEN 662</td>
<td>Statistical Methods in Biological and Agricultural Engineering</td>
</tr>
<tr>
<td>BAEN 665</td>
<td>Design of Biological Waste Treatment Systems</td>
</tr>
<tr>
<td>BAEN 667</td>
<td>Entropy Theory and its Applications in Water and Environmental Engineering</td>
</tr>
<tr>
<td>BAEN 669</td>
<td>Water Quality Engineering</td>
</tr>
<tr>
<td>BAEN 670</td>
<td>Air Pollution Engineering</td>
</tr>
<tr>
<td>BAEN 672</td>
<td>Small Watershed Hydrology</td>
</tr>
<tr>
<td>BAEN 673</td>
<td>Modeling Small Watersheds</td>
</tr>
<tr>
<td>BAEN 674</td>
<td>Vadose Zone Hydrology</td>
</tr>
<tr>
<td>BAEN 675</td>
<td>Hydrology Across Scale</td>
</tr>
<tr>
<td>BAEN 681</td>
<td>Seminar</td>
</tr>
<tr>
<td>BAEN 683</td>
<td>Per-Review Process and Publication</td>
</tr>
<tr>
<td>BAEN 684</td>
<td>Professional Internship</td>
</tr>
<tr>
<td>BAEN 685</td>
<td>Directed Studies</td>
</tr>
<tr>
<td>BAEN 689</td>
<td>Special Topics in …</td>
</tr>
<tr>
<td>BAEN 690</td>
<td>Theory of Research</td>
</tr>
<tr>
<td>BAEN 691</td>
<td>Research</td>
</tr>
</tbody>
</table>
4. Research in BAEN

Diverse disciplines, grants, publications

BIOLOGICAL & AGRICULTURAL ENGINEERING DEPARTMENT

4.1) The Disciplines

The department’s faculty engage in research in very diverse disciplines of biological and agricultural engineering. The department’s research efforts are organized into the following programmatic groups: Power and Machinery (PM), Post-Harvest Processing (PHP), Renewable Energy (RE), Soil and Water (SW), Structures and Environment (SE), Food Engineering (FE), Bioprocess Engineering (BE) and Information and Emerging Technologies (IET).

Research funding for the past 10 years is shown in Figure 4.1. The average amount of funding brought to the department over those years amount to approximately $4 million. The primary sources of research funding are federal, industry, and state (Figures 4.2). It could be noted that although historically a majority of funding was brought in via federal sources more recently a large portion of this funding has came from industry (46%). A list of research grants, contracts, and gifts for the past five years is shown in Appendix C.

The Biological & Agricultural Engineering Department faculty write papers that are published in archival journals (Figure 4.3). Some of our faculty members serve as editors and as members of editorial boards of various journals.
Figure 4.1: Research Expenditures

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditure ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>$ 3,013,459</td>
</tr>
<tr>
<td>2005</td>
<td>$ 2,928,471</td>
</tr>
<tr>
<td>2006</td>
<td>$ 3,135,490</td>
</tr>
<tr>
<td>2007</td>
<td>$ 3,261,242</td>
</tr>
<tr>
<td>2008</td>
<td>$ 3,630,270</td>
</tr>
<tr>
<td>2009</td>
<td>$ 4,803,783</td>
</tr>
<tr>
<td>2010</td>
<td>$ 5,902,505</td>
</tr>
<tr>
<td>2011</td>
<td>$ 5,799,611</td>
</tr>
<tr>
<td>2012</td>
<td>$ 4,463,336</td>
</tr>
<tr>
<td>2013</td>
<td>$ 4,017,863</td>
</tr>
<tr>
<td>2014</td>
<td>$ 3,504,419</td>
</tr>
</tbody>
</table>
Figure 4.2: Contract and Grant Awards
4.2) Research Thrusts and Future Growth

The following is a sample list of the research topics of interest and activities in the Department, categorized under key disciplines.

**Soil and Water**

- GIS-based irrigation district water distribution network simulation model for rehabilitation planning and network management/optimization
- Fate and transport of agricultural chemicals in the environment
- Modeling of the hydrologic cycle and crop yields at the watershed and river basin scales
- Drought decision making tool for agricultural producers and water managers
- Soil property changes due to the land application of waste produces from bioenergy
- Water, heat, and chemical transport measurement and modeling in variably-saturated porous media ranging from core-scale to regional-scale
- Wetlands for agricultural nonpoint source pollution control
- Land cover and land use change effects on hydrology
- Pedostructure characterization for soil health indicators
• Water Energy Food Nexus  Modeling, analysis and tradeoffs
• Measurement and parameter uncertainty determination and propagation through hydrologic and water quality models.
• Urban stormwater BMP planning design and implementation
• Aquatic Life Potential determination in urban streams.
• Climate change and its hydrologic impacts
• Droughts and their modeling
• Entropy theory and its application in environmental and water engineering
• Hydrologic modeling of various components of the hydrologic cycle
• Water quality assessment
• Hydraulics of open channel flow
  Modeling of extremes
• Frequency distributions of hydrologic variables

**Structures and Environment (including Air Quality)**

• Air quality engineering for agricultural operations
• Ammonia, PM, and VOC emission factors for animal and crop production systems
• A field-scale aeration system to control odor from open liquid manure storage facilities
• Renewable energy and environmental sustainability using biomass from dairy and beef animal production facilities
• Development of improved PM samplers for measuring agriculturally-derived PM
• Effects of environment on chemical expression in plants
• Effects of room air exchange rate on particle concentrations in health facilities.
• Wet scrubbers for removing gases and particulates from air.

**Power and Machinery**

• Image-processing solution to cotton color measurement problems
• Relationships between soil-landscape and dry land cotton lint yield

**Post-Harvest Processing**

• Development of a process for dehulling gossypol-free cottonseed
• Development of a process for producing polished guar splits
• Improvement of cotton ginning processes adapted for new harvest technologies
• Analysis of storage effects on seed cotton quality

**Food Engineering**

• Low-dose irradiation effects on quality and shelf-life of fresh and fresh-cut fruits, vegetables, and nuts
• Modeling and optimization of vacuum frying of fruits and vegetables
A powerful new approach to improve electron beam treatment of complex food items

Quantitative risk assessment to reduce risk of foodborne illness due to consumption of fresh and fresh-cut produce

Development of edible ancoatings to ensure safety of fresh-cut fruits

Development of antimicrobial delivery systems

Development of nanostructures for real-time detection of foodborne pathogens using electrochemistry techniques

Characterization of biological materials as inexpensive and ‘green’ polymeric matrices for delivery applications

Intelligent packaging development and applications

Applications of new materials (organogels, oleogels) to food process engineering

**Bioprocess Engineering**

Application of flocculation technologies for harvesting and dewatering of microalgae in biofuels production.

Cultivation methods of transgenic microalgae for optimal accumulation of therapeutic proteins

Process evaluation and efficacy for production of high-value bioproducts from microalgae

Process development and analysis of monoclonal antibody production from transgenic *Lemna minor*

Development of recovery and purification processes for recombinant protein products from plants

**Renewable Energy**

Biomass conversion to biofuels and power

Catalytic materials with novel functionalities

Fuel cells

Water Energy Food Nexus Modeling, analysis and tradeoffs

Comparison of solar PV systems (Si and GaAs)

Performance of 1kW wind power generation system installed near Texas A&M University

Design and development of solar crop dryers
The Future of the Department

Endowment, research support, top notch students

BIOLOGICAL & AGRICULTURAL ENGINEERING DEPARTMENT

The fine reputation of the Department of Biological & Agricultural Engineering is founded on its undergraduate programs. It has been characterized for its solid background in biology & agricultural engineering and technology systems management fundamentals and for having instilled a strong work ethic, as well as a can-do attitude among its graduates. The abiding appreciation of former students fuels much of the generous support the Department receives. Maintaining a continually updated, strong undergraduate and graduate programs will be the major factor in the future.

Strategic Goals and Future Growth

The Biological & Agricultural Engineering Department prepares our society to protect and sustain the environment, improve health, and feed the world through innovative education, research, and extension programs in Machine and Energy Systems, Food and Bioprocessing, and Environment and Natural Resources.

Our department has solved many problems by applying our core capabilities throughout the last century, including the development of the cotton module builder, high-efficiency irrigation technologies, rice drying, and the thermal conductivity probe. Building on these achievements, and identifying current and future societal challenges is key to determining our future strategic direction.

The major strategic challenges that our Department is uniquely equipped to address are:

- **Food security and safety.** Ensure availability and access to a sufficient quantity of affordable, nutritious, and safe food.

- **Air quality.** Ensure that the particulate and gaseous emissions originating from agricultural activities are not injurious to public health and welfare, do not negatively impact the environment, and encourage the economic viability of agriculture.

- **Agricultural sustainability. Producing and sustaining the food supply for global populations.**

- **Waste management.** Ensure pollutants from beef, dairy, swine and poultry concentrated feeding operations and sewage facilities are in compliance with environmental laws.
Data science. The development and use of specialized techniques for management, processing, and interpretation of large and/or complex data sets, often but not exclusively associated with large spatial scales or high time resolution (or both), as well as techniques for the acquisition of those data sets using rapidly advancing, remote sensing technologies.

Energy sustainability. Development of innovative processes for the sustainable production of power and transportation fuels.

Water security. Generally referring to “the capacity of a population to safeguard sustainable access to adequate quantities of water of acceptable quality”. The term thus integrates the more granular dimensions of availability, accessibility, adequacy, and quality, such that any deficiency in one dimension is understood to have reduced the overall security of a population’s livelihood, well-being, socio-economic development, and supporting ecosystems.

Future directions for BAEN activities are based on the BAEN Strategic Plan. The department will focus on the seven following strategic goals applied to each core capability:

1. **Enhance graduate employability.**
   Our graduates must be prepared academically for their chosen professions and equipped with necessary skills for the workplace. These areas will vary based on the needs of the employer. Some graduates will require engineering registration while others will need to be highly specialized in one core capability. Degree plans must be comprehensive enough to be versatile, specialized enough to be useful, yet not exceed 128 hours. Graduates must be able to address global needs in developing regions, while remaining competitive nationally. Ensure that an individual student’s degree-plan is appropriately suited to that student’s professional aspirations, ABET accreditation requirements, and the expressed expectations of the student’s likely employers.

2. **Develop and implement emerging technologies in food and agricultural applications.**
   The required expertise in legacy skills must be evaluated against the need for expertise in emerging technologies to ensure our graduates are equipped to address global challenges. Traditional engineering capabilities are especially applicable in emerging regions, while advanced systems are in demand in others. Additionally, there is a need to promote faculty development in emerging areas.

3. **Prepare versatile, resilient, and innovative graduates.**
   Enhance and expand opportunities for students to participate in international educational, research, outreach, and service initiatives and programs which will enhance their ability to thrive in unfamiliar environments, develop unconventional thinking, and improve problem-solving abilities. Increase support for international and extracurricular opportunities to increase the breadth and depth of student involvement and learning.
4. **Expand instructional methodologies while maintaining high standards of excellence.**
Curricular. Assess, develop, expand, and improve experiential learning opportunities in undergraduate and graduate education. Increase support for curricular programs and classroom activities that strengthen planning, design, teamwork, leadership, professionalism, writing, and presentation skills.
Extracurricular. Increase support and emphasis at an institutional level for internships and extracurricular programs (Aggie Pullers, Fountain Wars, etc.) which enhance and expand the learning experience. Leverage and incentivize student leadership in these areas.
Extended classroom. Identify and develop distance education and online educational and extension opportunities. Ensure that our high standards of instruction and student learning are not sacrificed in the effort to expand our reach.

5. **Expand multidisciplinary and integrated research and extension programs.**
Global challenges such as water, food, energy, shelter, and health require integrative thinking that cuts across traditional disciplines. Increase research partnerships and center activities within the department and with others who complement our strengths and increase diversity of thought and innovation. Develop physical and organizational infrastructure needed for success in these areas, including additional personnel requirements. Expand and facilitate participation and leadership in multidisciplinary research teams.

6. **Expand current and develop new revenue sources.**
Leverage extension education to increase impact and visibility of departmental programs, staff to support this goal. Increase participation in licensing and commercialization of intellectual property by identifying departmental benefits, individual revenue potential, and institutional processes. Expand and leverage network of former students and industry groups to increase development efforts.

7. **Regain and expand capacity to meet growing outreach education and lifelong learning needs.**
Identify and recover critical expertise, educational programming, and information support needs of clientele (end users, technical service providers, and agribusiness) and prioritize gaps in subject matter expertise. Expand, develop, and deliver effective resources and programs in these areas.
Appendix A
Curriculum Vitae

BIOLOGICAL & AGRICULTURAL ENGINEERING DEPARTMENT

Faculty Biographical Briefs for the Biological & Agricultural Engineering Department at Texas A&M University, College Station, TX

• S. Ale
• S. Capareda
• K. Casey
• E. Castell-Perez
• J. M. Enciso
• C. Engler
• W.B. Faulkner
• S. Fernando
• Y. Ge
• J. Gilley
• C. L. Gomez
• F. H. Jaber
• J. Jeong
• R. Karthikeyan
• A. Kenimer
• R. Lacey
• B. Lesikar
• B. Mohanty
• R. Mohtar
• R. Moreira
• S. Mukhtar
• Z. Nikolov
• C. Parnell
• D. Porter
• G. Riskowski
• S. Searcy
• Z. Sheng
• V.P. Singh
• P. Smith
• R. Srinivasan
• A. Thomasson
• R. Sui
• M. Rao
SRINIVASULU ALE
Assistant Professor (Geospatial Hydrology)

EDUCATION
Ph.D., Agricultural and Biological Engineering, Purdue University, West Lafayette, IN, 2009
M.S., Agricultural Engineering, G.B. Pant University of Agriculture & Technology, India, 1992
B.S., Agricultural Engineering, Andhra Pradesh Agricultural University, India, 1989

TEXAS A&M UNIVERSITY SYSTEM EMPLOYMENT
Assistant Professor, Texas A&M Agrilife Research, Vernon, TX, 2010- Present
Assistant Professor, Biological & Agricultural Engineering, Texas A&M University, 2010- Present

OTHER PROFESSIONAL EMPLOYMENT
Postdoctoral Research Associate, Purdue University, West Lafayette, IN, 2009-2010
Assistant Professor, Agricultural Engineering, A.N.G. Ranga Agricultural Univ., India, 1993-2005

PRINCIPAL PUBLICATIONS (selected from last 5 years out of 35)
(‘Post-Doc and **Graduate/Undergraduate student under my supervision)

**SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:**
- Member, American Society of Agricultural and Biological Engineers (ASABE); American Geophysical Union (AGU); International Association of Hydrological Sciences (IAHS).
- Member, Alpha Epsilon Agricultural Engineering Honor Society.
- Life member, Indian Society of Agricultural Engineers; Andhra Agricultural Union.

**HONORS AND AWARDS:**
- 2014 Award for Excellence in Research, Biological & Agricultural Engineering, TAMU.
- 2012 Outstanding Reviewer, Soil & Water Division, ASABE Journals.
- 2008 Outstanding Ph.D. Student Award, Agricultural & Biological Engineering, Purdue Univ.
- 2003 Young Scientist Award (Gold medal), A.N.G Ranga Agricultural University, India
INSTITUTIONAL AND PROFESSIONAL SERVICE (last 5 years):
  • Associate Editor, Soil and Water Division, ASABE Journals, 2013-2015.
  • Vice-Chairman, NRES-23 Drainage Group, ASABE Soil & Water Division (2013-2015).
  • Vice-Chairman, NRES-07 Nomenclature Committee.
  • Vice-Chairman (Continuing Education), ASABE Texas Section, 2014-2015.
  • Member, Recognitions & Events Committee, Biological & Agricultural Engineering, TAMU

PROFESSIONAL DEVELOPMENT ACTIVITIES (last 5 years):
  • Agricultural Policy/ Environmental Extender (APEX) Model Workshop, Texas Water Resources Institute, Texas A&M University, College Station, 18-19 January, 2012.
  • National Science Foundation Day, Texas State University, San Marcos, February 8, 2011.
SERGIO C. CAPAREDA  
Associate Professor

EDUCATION  
Ph.D. Agricultural Engineering: Texas A&M University, August 1990  
M. Eng’g, Asian Institute of Technology, Bangkok, Thailand, August 1985  
B.S. Agricultural Engineering: Univ. of the Philippines, Los Baños, March 1982

TAMU EMPLOYMENT  
September 2011- present: Associate Professor  
November 2005 to 2011: Assistant Professor, BAEN, TAMU  
April 2003 – October 2005: Visiting Research Scientist, BAEN, TAMU

OTHER PROFESSIONAL EMPLOYMENT:  
Associate Professor, College of Engineering and Agro-Industrial Technology, University of the Philippines at Los Baños, College, Laguna, Philippines (1997-2004)  
Assistant Professor, College of Engineering and Agro-Industrial Technology, University of the Philippines at Los Baños, College, Laguna Philippines (1990-1997)  
Instructor, College of Engineering and Agro-Industrial Technology, University of the Philippines at Los Baños, College, Laguna Philippines (1983-1990)  
Research Assistant, College of Engineering and Agro-Industrial Technology, University of the Philippines at Los Baños, College, Laguna Philippines (1982-1983)

PATENTS and Intellectual Properties:  

REGISTRATION:  
Registered Professional Engineer, Texas Board of Professional Engineer, Texas PE #103161.

PRINCIPAL PUBLICATIONS OF THE LAST FIVE YEARS (out of 47):  
   http://dx.doi.org/10.1016/j.biortech.2014.06.103  


Book Written

SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH A MEMBER:
ASAE – American Society of Agricultural Engineers
ASEE – American Society for Engineering Education
PSAE – Philippine Society of Agricultural Engineers

HONORS AND AWARDS:
2011-2015 Returning “Balik” Scientist Award given by the Department of Science and Technology, Philippines, the highest award bestowed on overseas Filipino scientists to help accelerate scientific development in his field of expertise (Renewable Energy)
2011 Award for Excellence in Research, Biological and Agricultural Engineering Department, TAMU.
2010 Vice Chancellor’s Award in Excellence as a Member of Research Team, COALS, TAMU.
2010 Texas Environmental Excellence Award, the highest environmental quality award for agriculture in the State of Texas, member of team receiving award, given by the Texas Commission for Environmental Quality (TCEQ).
2008 Alfred P. Sloan Foundation Mentor for commitment to advancing underrepresented minority students in engineering and for partnership with the Alfred P. Sloan Foundations Minority Ph.D. Program.

INSTITUTIONAL AND PROFESSIONAL SERVICE IN THE LAST FIVE YEARS:
American Society of Agricultural Engineers
Vice-Chair of the ASABE SE 414 Renewable Energy for Power Gen.Com.:2009-2010/2012-2013
Member, ASABE SE 305, FPE 709, PM3/7/23 Committees (2005- present)
Associate Editor and Member of Editorial Board: International Journal of Integrated Energy Systems, Barcelona, Spain, 2008 - present
Texas A&M University, Biological and Agricultural Engineering
Chair, Health and Safety Committee,

PROFESSIONAL DEVELOPMENT ACTIVITIES IN THE LAST FIVE YEARS:
Getting Started with eCampus – August 6, Rm 004 Heldenfels Hall, TAMU
1st Annual Practical Short Course on Industrial Food & Drug Fermentation and Separation Biotechnology, Texas A&M University, Feb 2-4, 2014 Sponsored by the Food Protein Research and Development Center, College of Engineering, TAMU
KENNETH D CASEY
Associate Professor

Texas A&M AgriLife Research
Texas A&M System
6500 Amarillo Blvd, West
Amarillo, TX 79106-1796
Phone: (806) 677-5600, Fax: (806) 677-5644
E-mail: kdcasey@ag.tamu.edu

PRESENT POSITION
Associate Professor of Air Quality Engineering

EDUCATION
• University of Kentucky (2005) – Ph.D. (Biosystems and Agricultural Engineering)
• Clemson University (1992) - Master of Science (Agricultural Engineering)
• University of Southern Queensland, Aust (1986) - Graduate Diploma in Information Processing
• University of Southern Queensland, Aust (1981) - Bachelor of Engineering (Agricultural)

WORK EXPERIENCE
• Associate Professor, Texas A&M AgriLife Research, Amarillo, TX (2011 - current)
• Assistant Professor, Texas AgriLife Research, Amarillo, TX (2005-2011)
• Research Specialist, University of Kentucky, Lexington, KY (2001-2005)
• Principal Environmental Engineer, Department of Primary Industries, Toowoomba, QLD (1995 - 2001)
• Agricultural Engineer, Department of Primary Industries, Toowoomba, QLD (1981 – 1995)

AREAS OF INTEREST

MAIN RESEARCH PROJECTS
• Greenhouse gas emissions from beef cattle feed yards
• Water usage at High Plains dairies.

PROFESSIONAL REGISTRATION
Registered Professional Engineer in Queensland.

PROFESSIONAL SOCIETIES
• American Society of Agricultural Engineers
• American Society Heating, Refrigerating and Air-Conditioning Engineers
• Air & Waste Management Association
• Clean Air Society of Australia and New Zealand
**INTERNATIONAL EXPERIENCE**
Worked for 20 years in Australia (1981 – 2001) as an extension engineer on functional design of agricultural buildings and environmental control, then as a research engineer and program leader on environmental management issues for intensive animal production systems.

**PUBLICATIONS LIST** (Selected)

**PEER REVIEWED JOURNALS**  


M. ELENA CASTELL-PEREZ  
Professor  

EDUCATION:  
B.S., Food Engineering, University of Campinas, Brazil, 1980  
M.S., Agricultural Engineering, Michigan State University, 1984  
Ph.D., Agricultural Engineering, Michigan State University, 1990  

TEXAS A&M UNIVERSITY EMPLOYMENT:  
18 years on this faculty, Initial appointment: June 1, 1996  
Professor, Biological and Agricultural Engineering Dept., 2005 to present  
Associate Professor, Biological and Agricultural Engineering Dept., 2000-2005  
Assistant Professor, Biological and Agricultural Engineering Dept., 1996-2000  
Director, Center for Food Processing & Engineering, Institute of Food Science and Engineering, 1998-2004  

OTHER PROFESSIONAL EMPLOYMENT:  
Assistant Professor, Food Science and Animal Industries Dept., Alabama A&M University, Huntsville, AL, 1991-1996  
Chief Engineer, INLATEC, Los Teques, Venezuela, 1981-1982  

REGISTRATION:  
Registered Professional Engineer, State of Texas, No. 84533  

PRINCIPAL PUBLICATIONS (Last 5 years):  


Book Chapters:


SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:
- American Society of Agricultural and Biological Engineers (ASABE)
- Institute of Food Technologists (IFT)
- Society of Rheology
- American Society of Women Engineers

HONORS AND AWARDS:
- 2013-2014 Charles W. Crawford Service Award, Dwight Look College of Engineering
- 2011-2012 Tenneco Meritorious Teaching Award, Dwight Look College of Engineering
- 2012 BAEN Department Award for Excellence in Service
- 2012 IFT Food Engineering Division Volunteer Award
- 2012 IFT International Division Service Award
- 2010 BAEN Department Award for Excellence in Teaching
- Alpha Epsilon, Agricultural Engineering Society
- Phi Beta Delta, International Scholar Honor Society
- Phi Tau Sigma, Food Science Honorary Society. Elected At Large councilor (2011-2013; 2014-2016)

INSTITUTIONAL AND PROFESSIONAL SERVICE (Last 5 years):

Editorial:
- Editorial Board: Journal of Food Quality (2000-present)

Professional Society:
- IFT:
  - Past Chair, Chair, Chair-elect and Secretary of Food Engineering Division (2010-2014)
  - Chair, Chair-elect and Secretary of International Division (2010-2013)
  - Member of the IFT Food Nanoscience Advisory Panel (2010-present)
  - Phi Tau Sigma, Food Science Honorary Society. Elected At Large councilor (2011-2013; 2014-2016)
  - Member of IFT’s Food Engineering Subpanel for the 2012-2013 year.
  - 2014 IFT Graduate Student Competition Chair for the 2014 IFT Annual Meeting
  - 2012 IFT Webinar: Teaching Food Engineering: Challenges and Opportunities as part of “Food Engineering, and Integral Component of Food Science: Current and Future Trends”
h. 2010 IFT pre-meeting Short Course on Food Processing and Packaging for Product Developers. Physical properties of materials. July 16, 2010
i. 2010 IFT pre-meeting Short Course on Food Processing and Packaging for Product Developers. Evaluation of quality attributes. July 16, 2010

Department:
- BAEN Promotion and Tenure Chair – 2012-2012; 2012-2014
- Director of Distance Education program, 2014-present
- BAEN (2007-2011; 2014-present) and AGSM (2007-present) Undergraduate Curricula Committees
- Communications and Marketing Committee (Chair since 2014)
- Advisor of AGSM Student Club (2013-2015)

Texas A&M:
- Voting Member, TAMU Athletic Council (2005 – 2013).
- Steering Committee Chair, TAMU’s Women Engineering Faculty Interest Group (WEFIG) (2005 – present)
- Internal Advocate, ADVANCE Scholars Program (2012-present)
- BAEN representative to ELTAC (Engineering Learning Technology Advisory Council. College of Engineering (September 2014-present)
- COALS subcommittee feeding Our World Grand Challenge. March 2013
- COALS subcommittee Improving our Health Grand Challenge. March 2013
- COALS P&T committee, member (2011-2013)
- Activity Leader of the Faculty Recognition Committee for the Texas A&M NSF Funded ADVANCE program (2010-present)
- Executive Committee member of the Interdisciplinary Graduate Faculty of Food Science (January 2009-present)

PROFESSIONAL DEVELOPMENT ACTIVITIES (Last 5 years):
- Attended ASABE and IFT Meetings
- IFT Educational Workshops
- Attended Grant Writing Workshops (NIH and NSF) (September-November 2014)
- Continuing education:
  - Difficult Dialogues Workshop sponsored by the VP of Diversity. Four Modules. (February-March 2013)
  - Difficult Dialogues Workshop 2. Fifth Module. October 2013
JUAN M. ENCISO  
Associate Professor

EDUCATION:
Ph.D., Agricultural and Biological Systems Engineering, University of Nebraska- Lincoln, 1992
M.S., Water Management. Instituto Tecnologico de Estudios Superiores de Monterrey, Monterrey, N.L. Mexico. 1986
B.Sc., Irrigation Engineering. U.A.A.A.N. Saltillo, Coahuila, Mexico. 1984

TEXAS A&M UNIVERSITY EXPERIENCE:
Associate Professor, Biological and Agricultural Engineering, Texas A&M AgriLife Research. 2011
Associate Professor and Extension Agricultural Engineer, Biological and Agricultural Engineering, Texas A&M AgriLife Extension. 2006 – 2011
Assistant Professor and Extension Specialist, Biological and Agricultural Engineering, Texas A&M AgriLife Extension. 2003 – 2006
Assistant Professor and Extension Agricultural Engineering Specialist, Biological and Agricultural Engineering, Texas A&M University System. 1998 to 2003

OTHER PROFESSIONAL EMPLOYMENT:
Professor, Engineering Department, DEPFI. Universidad Nacional Autonoma de Mexico. Cuernavaca, Morelos, Mexico. 1992-1997.

REGISTRATION:
Registered Professional Engineer, Texas Board of Professional Engineers (Texas PE 92241)

PRINCIPAL PUBLICATIONS (Selected publications from the last 5 years):


SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:
American Society of Agricultural and Biological Engineers

HONORS AND AWARDS:

☐ American Society of Agricultural Engineers Blue Ribbon Award for an outstanding entry in the 2006 Education Aids Competition Publications.
☐ Vice Chancellor’s Award in Excellence, 2006. Member of the Rio Grande Initiative Team. The Texas A&M University System.
☐ Superior Paper Award from the American Association of Agricultural and Biological Engineers. 2008.
☐ Texas Environmental Excellence Award – Agriculture, 2011. Water Conservation, Ag Demonstration Initiative Project with Harlingen Irrigation District.

INSTITUTIONAL AND PROFESSIONAL SERVICE (last 5 years):
American Society of Agricultural Engineers
Associate Editor, Soil and Water Division, 2009-to date. Associate Editor, Journal of Subtropical Science. 2007-to date. SW-245 Microirrigation.
Member from 1992
SW-241 Sprinkler irrigation. Member from 1992

PROFESSIONAL DEVELOPMENT ACTIVITIES (last 5 years): Irrigation workshop and field tour. Santiago, Chile (2014) Irrigation workshop and field tour. Aguascalientes, Mexico (2014)
Cady R. Engler
Professor

Education:
Ph.D., Chemical Engineering, University of Waterloo (Canada), 1980
M.S., Chemical Engineering, Kansas State University, 1974
B.S., Chemical Engineering, Kansas State University, 1969

Texas A&M University Employment:
Professor Emeritus, Biological and Agricultural Engineering, Texas A&M University, 2014.
Professor, Biological and Agricultural Engineering, Texas A&M University, 1999 to 2014.
Associate Professor, Agricultural Engineering, Texas A&M University, 1984 to 1999.
Associate Research Engineer, Food Protein Research and Development Center, Texas Engineering Experiment Station, 1984 to 1986.
Assistant Professor, Agricultural Engineering, Texas A&M University, 1981 to 1984.
Assistant Research Engineer, Food Protein Research and Development Center, Texas Engineering Experiment Station, 1980 to 1984.
Assistant Professor, Bioengineering Program, Texas A&M University, 1978 to 1981.

Other Professional Employment:

Registration:
Registered Professional Engineer, State of Texas, No. 51522

Principal Publications (Last 5 Years):

Scientific and Professional Society Membership:
American Society of Agricultural and Biological Engineers
Sigma Xi

Honors and Awards:
BAEN Award for Excellence in Teaching, 2012
ASABE Professor of the Year Award, Texas A&M Preprofessional Branch, American Society of Agricultural and Biological Engineers (ASABE), 2010
Charles W. Crawford Service Award, Dwight Look College of Engineering, Texas A&M University, 2010
American Society of Agricultural and Biological Engineers (ASABE) President’s Citation, 2008
American Society of Agricultural and Biological Engineers (ASABE) Outstanding Manuscript Reviewer, 2006
Award in Excellence (Team Research), Texas A&M University Agriculture Program, 1988

INSTITUTIONAL AND PROFESSIONAL SERVICE (last 5 years):
American Society of Agricultural Engineers
   Biological Engineering Division
      Secretary, 2005-06; Vice-chair, 2006-07; Chair, 2007-08
   Biomass Energy and Alternate Products Committee, 1984-
   Bioconversion and Bioprocesses Committee, 2000-
   Biological Engineering Education Committee, 2000-
   Associate Editor, Biological Engineering Division, 1999-
   Nominating Committee, 2003-2005
Texas A&M University Faculty Senate, 2000-2006
   Academic Affairs Committee, Chair, 2003-2005
   Executive Committee, 2003-2004
   Representative to Academic Operations Council, 2003-2005
Texas A&M University, Dwight Look College of Engineering
   Undergraduate Advisors Committee, 1999-
   Scholarship Committee, 2004-
Texas A&M University, College of Agriculture and Life Sciences
   Quality Enhancement Program Committee, 2005-2008
   Scholarship Committee, 1999-
   Undergraduate Program Committee, 1999-
Texas A&M University, Biological and Agricultural Engineering Department
   Undergraduate Engineering Programs Committee, Chair, 2000-
   Instructional Enhancement Fund Committee, Chair, 1999-

PROFESSIONAL DEVELOPMENT ACTIVITIES (last 5 years):
9th Annual Assessment Conference, Texas A&M University, February 2009.
WILLIAM B. FAULKNER
Assistant Professor

EDUCATION:
Ph.D., Biological and Agricultural Engineering, Texas A&M University, 2008
M.S., Biological and Agricultural Engineering, Texas A&M University, 2006
B.S., Agricultural Engineering, Texas A&M University, 2004 (Minor in Agronomy)

TEXAS A&M UNIVERSITY EMPLOYMENT:
Assistant Professor, Biological and Agricultural Engineering, Texas A&M University, Ja. 2012 to present
Research Assistant Professor (67%) / Lecturer (33%), Biological and Agricultural Engineering, Texas A&M University, Sept. 2008 to Dec. 2011
Lecturer (50%) / Research Associate (50%), Biological and Agricultural Engineering, Texas A&M University, Jan. 2008 to Sept. 2008
Research Associate, Biological and Agricultural Engineering, Texas A&M University, 2006 to 2007

OTHER PROFESSIONAL EMPLOYMENT:
Consultant, 2006 to present

REGISTRATION:
Licensed Professional Engineer (Texas PE 107293) since 2010
National Association of Safety Professionals
Certified Safety Auditor since 2012
Certified Safety Manager Trainer (General Industry) since 2013

PRINCIPAL PUBLICATIONS (PREVIOUS 5 YEARS):


**SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:**
American Society of Agricultural and Biological Engineers

**HONORS AND AWARDS:**
Colorado Environmental Leadership Program Bronze Award – for development of an “Early Warning System” to reduce nitrogen deposition in Rocky Mountain National Park, 2014
Gale A. Holloway Professional Development Award – American Society of Agricultural and Biological Engineers, 2014
College of Agriculture and Life Sciences Dean’s Outstanding Achievement Award for Early Career Research, 2012
Member of project team awarded the Texas Environmental Excellence Award – Agricultural Category for work on “Air Quality: Reducing Emissions from Cattle Feedlots and Dairies,” 2010
Young Engineer of the Year – American Society of Agricultural and Biological Engineers – Texas Section, 2009
National Science Foundation Graduate Research Fellow, 2004-2007
Texas A&M University Regents Fellow, 2004, 2006

**PROFESSIONAL AND INSTITUTIONAL SERVICE:**
American Society of Agricultural and Biological Engineers
   Environmental Air Quality Committee, SE305
   Session moderator at Annual International Meetings, 2006 – present
Secretary (2010-2012)  
Vice-Chair (2012-2014)  
Chair (2014-2016)

Cotton Engineering Committee, PM23/7/3  
Secretary (2007-2009)  
Vice-Chair (2009-2011)  
Chair (2011-2013)  
Past-Chair (2013-2015)

Publications Review Committee, SE05  
Associate Editor for Structures and Environment Division (2011 – present)

Power and Machinery Division Steering Committee, PM02 (2011 – 2013)

Environmental Quality Coordinating, T-09 (2012-present)

Environmental Quality and Control Group, SE-30 (2012-present)

Texas Section  
Vice Chair – Continuing Education (2010, 2012)  
Vice Chair – Membership and Registration (2011)  
Chair – Awards Committee (2013)  
Chair Elect (2014)  
Chair (2015)

USDA Agricultural Air Quality Task Force, 2011-2015  
Co-Chair/Chair of Air Quality Standards Committee (2011-2015)


National Cotton Ginners Association Air Quality Subcommittee (2009-present)

Texas A&M University, Biological and Agricultural Engineering Department  
Awards and Recognition Committee, 2008 - present

Agricultural Systems Management Undergraduate Program and Recruiting Committee, 2008 – present

Agricultural Systems Management Curriculum Review Committee, 2008 - present
SANDUN D. FERNANDO  
Associate Professor

EDUCATION:  
Ph.D., Agricultural and Biological Systems Engineering, Univ. of Nebraska-Lincoln, 2003  
M.S., Agricultural and Biological Systems Engineering, Univ. of Nebraska-Lincoln, 2001  
B.Sc., Agricultural Engineering (major), Univ. of Peradeniya, Sri Lanka, 1995  
Certificate, Nanomaterials for Biological and Pharmaceutical Technologies, Professional  
Education, Massachusetts Institute of Technology, 2009

TEXAS A&M UNIVERSITY EMPLOYMENT:  
Associate Professor, Biological and Agricultural Engineering, Texas A&M University, 2011-  
Assistant Professor, Biological and Agricultural Engineering, Texas A&M Univ., 2008-11

OTHER PROFESSIONAL EMPLOYMENT:  
Assistant Professor, Agricultural and Biological and Engineering Department, Mississippi State  
University, 2003 to 2008.  
Assistant Lecturer, Department of Agricultural Engineering, University of Peradeniya, Sri Lanka,  
1998 – 1999  
Factory Administration Manager, Unilever Ceylon Ltd., 1996-1998

REGISTRATION:  
Registered Professional Engineer, Texas Board of Professional Engineers (Texas PE 104143)

PRINCIPAL PUBLICATIONS (Selected from last 5 years out of 57; *supervisees of Dr. Fernando;  
Principal Author underlined; IP – In Print):  
Kulkarni*, S.V. and S. Fernando. 2014. Separation of Palmitic and Palmitoleic Acid and their  
Gunawardena* D. A. and S. Fernando. 2014. A Thermodynamic Equilibrium Analysis of Glucose  
Conversion to Hydrocarbons. Chemical Engineering Communications. Taylor and Francis. 201(8).  
1115-1124.  
Perspectives of the Anode of a Microbial Fuel Cell. Microbial Fuel Cell. Book edited by Chin-Tsan  
Nawaratna*, G. and S. Fernando. 2013. Reaction Kinetics of Transesterification with Titanium  
Society. 52(25), 8392-8398.  
to produce gasoline grade hydrocarbons by high pressure pyrolysis. Int.J. of Ren. and Sust. Energy.  
Nawaratna, G., Capareda, S., and S. Fernando. 2013. Effect of metal groups in transition metal  
alkoxide catalysts on transesterification. Advances in Materials. 2012; 1(1). 1-8. doi:  
10.11648/j.am.20120101.11.


SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:
American Society of Agricultural and Biological Engineers
American Chemical Society

HONORS AND AWARDS:
- Highly Cited Researcher (Thomson-Reuters Essential Science Indicators, 2014 -- ranking among the top 1% most cited earning the mark of exceptional impact).
- TAMU Assoc. of Former Students Distinguished Achievement Award for Teaching (2014).
- Barbara and Ralph Cox ’53 Faculty Fellow 2013-2014, Texas A&M Engineering Program.
- Biological and Agricultural Engineering Department 2012 Award for Excellence in Research.
- Presidential Citation, Institute of Biological Engineering for exemplary service to IBE (2012).
• Teaching Excellence Award (Spring, 2011) – The Texas A&M University System
• Outstanding Professor of the Year (2011) – Awarded by the ASABE Student Club
• Biological and Agricultural Engineering Department 2010 Award for Excellence in Teaching.

INSTITUTIONAL AND PROFESSIONAL SERVICE (last 5 years):
American Society of Agricultural Engineers
Associate Editor, Food and Process Engineering Division, 1999-to date.
Biobased Energy, Fuels, and Products Committee, Energy Systems Division. Vice-Chair 2013 to
date; Member 2004-to date.
Texas A&M University, Biological and Agricultural Engineering Department
Chair, Graduate Program Committee.

PROFESSIONAL DEVELOPMENT ACTIVITIES (last 5 years):
(ePortfolio) Building Your Teaching Portfolio (2014).
COMSOL Multiphysics workshop (2014).
Molecular Modelling – Laboratory for Molecular Simulation, Department of Chemistry, TAMU (2014).
Getting Started with eCampus – January 09, 2014, 004 Heldenfels Hall, TAMU (Instructor: Jeff Kurtz).
Microsoft Project 2010 - Essentials. Employee & Organizational Development (EOD), Division of
Finance, TAMU (Instructor: John E. Gonzales)( 2013).
Business Writing Essentials. EOD, Division of Finance, TAMU (2012).
Mistake-free Grammar and Proofreading. Fred Pryor Seminars (0.6 CEUs)(2011).
Heterogeneous Catalysis, Short Course, Chemical and Biomolecular Engineering Department.
University of Houston (2010).
Guy Fipps, PhD, P.E.
Professor and Extension Agricultural Engineer - Irrigation, Water Management
Biological and Agricultural Engineering
Texas A&M AgriLife Extension Service
College Station, Texas

EDUCATION

B.A. Liberal Arts, University of Texas, Austin, 1977.
B.S. Agricultural Engineering, Texas A&M University, College Station, 1979.
M.S. Biological and Agricultural Engineering, North Carolina State University, Raleigh, 1984.

PROFESSIONAL APPOINTMENTS

2003 - 2012 Director, Irrigation Technology Center. Texas A&M University System.
1988 - Professor and Extension Agricultural Engineer, Texas A&M University System, College Station (promotions in 1994, 1999).
1985 - 1988 USDA National Needs Fellow, Department of Biological and Agricultural Engineering, North Carolina State University.
1984-1985 Agricultural Engineer, CARE-International, Chad.
1982-1984 Graduate Research Assistant, Department of Biological and Agricultural Engineering, North Carolina State University.
1980 - 1981 Research Associate, Texas Agricultural Experiment Station, Department of Agricultural Engineering, Texas A&M University.
1975-1977 Peace Corps Volunteer - Wells Specialist, Upper Volta (Burkina Faso), West Africa.

MAJOR AWARDS

PEI Professional Engineer of the Year Award, ASABE (American Society of Agricultural and Biological Engineers), 2014.
USCID Merrian Improved Irrigation Award, (United States Commission on Irrigation and Drainage), 2013.
Award for the Advancement of Surface Irrigation, ASABE (American Society of Agricultural and Biological Engineers), 2012.
Best Paper of the Year Award, ICID Journal of Irrigation and Drainage (International Commission on Irrigation and Drainage), 2011.
Excellence in Extension Education., Biological and Agricultural Engineering, Texas A&M University, 2011.

**MAJOR PROGRAMS AND WEBSITES**

*The Irrigation Technology Program* ([http://itc.tamu.edu](http://itc.tamu.edu)).
*Irrigation District Program* ([http://idea.tamu.edu](http://idea.tamu.edu)).
*Texas A&M School of Irrigation* ([http://irrigation.tamu.edu](http://irrigation.tamu.edu)).
*TexasET Network and Web Site* ([http://texaset.tamu.edu](http://texaset.tamu.edu)).
*WaterMyYard Program* ([http://WaterMyYard.org](http://WaterMyYard.org))
South Texas Irrigation Conference (series)
Lower Rio Grande Irrigation Conference (series)
Seminar on Water Rights and Public Policy (occasional series)

**PROFESSIONAL REGISTRATION/AFFILIATIONS**

Registered Professional Engineer, State of Texas (certificate number 70876).
American Society of Biological and Agricultural Engineers: Associate Editor, Journal of Applied Engineering in Agriculture, 1995-1997;
American Society of Civil Engineers
U.S. Committee on Irrigation and Drainage:
Irrigation Association.
American Geophysical Union.
American Water Resources Association
Friends of Burkina Faso: Director, 2004 –.
YUFENG GE  
Assistant Professor

EDUCATION:

- B.S.  Mechanical Engineering  Nanjing Forestry University  2000
- M.S.  Mechanical Engineering  Nanjing Forestry University  2003
- Ph.D. Biological & Agricultural Engineering  Texas A&M University  2007

TAMU FACULTY EMPLOYMENT:  
10/2010 to 12/2013.  Research Assistant Professor.  Biological & Agricultural Engineering

OTHER PROFESSIONAL EMPLOYMENT:  
- 12/2009 to 10/2010.  Assistant Research Engineer.  BAEN. TAMU
- 01/2014 to present.  Assistant Professor.  Biological Systems Engineering, University of Nebraska – Lincoln

STATES REGISTERED AS PROFESSIONAL ENGINEER:  
NA

PRINCIPAL PUBLICATIONS OF THE LAST FIVE YEARS:


**SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH A MEMBER:**
American Society of Agricultural and Biological Engineers (ASABE)
American Society of Agronomy, Crop Science Society of America, Soil Science Society of America (ASA-CSSA-SSSA)

**HONORS AND AWARDS IN THE LAST FIVE YEARS:**
2011 ASABE Texas Section “Young Engineer of the Year”

**INSTITUTIONAL AND PROFESSIONAL SERVICE IN THE LAST FIVE YEARS:**
Associate Editor, Power & Machinery Division, American Society of Agricultural & Biological Engineers
USDA NIFA Review Panel, 2014, Washington DC
NSF CISE Review Panel, 2013, Washington DC

**PROFESSIONAL DEVELOPMENT ACTIVITIES IN THE LAST FIVE YEARS:**
Attended ASABE International meetings
JAMES R. GILLEY
Professor Emiritus

HOME ADDRESS

4710 Nantucket Drive
College Station, Texas  77845
(979) 690-0458
College Station, Texas  77843-2117
Phone: (979) 458-1428
Fax: (979) 862-3442
E-mail: gilley@tamu.edu
INTERNET: http://baen.tamu.edu

BUSINESS ADDRESS

Biological & Agricultural Engineering
Texas A&M University Department Phone:
311 Scoates Hall

EDUCATION

Atended Pueblo College, Pueblo, Colorado, 1962-63
Major - Engineering

B.S. with High Distinction, Colorado State University, Fort Collins, Colorado, June 1966
Major - Agricultural Engineering

M.S., Colorado State University, Fort Collins, Colorado, June 1968
Major - Agricultural Engineering
Thesis Title: *Intake Function and Border Irrigation*.

Ph.D., University of Minnesota, Minneapolis, Minnesota, December 1971
Major - Agricultural Engineering; Minor - Fluid Mechanics
Dissertation Title: *Steady Two-Dimensional Infiltration from Buried Line Sources*.

HONORS

Professional

Awarded the ASAE Massey-Ferguson Educational Award - July, 1998
Elected to the grade of Fellow of ASAE - 1993
ASAE Honor Paper Award – 1978
Member of the European Academy of Sciences
Who's Who in the Midwest - 1979, 1983
Who's Who in Technology Today - 1979
Member of Seven Honor Societies: Sigma Xi, Phi Kappa Phi (Secretary, University of Minnesota Chapter, 1974-75), Sigma Tau, Alpha Epsilon, Gamma Sigma Delta, Alpha Zeta, Phi Theta Kappa
SUMMARY OF PROFESSIONAL EXPERIENCE Dates of

<table>
<thead>
<tr>
<th>Employer</th>
<th>Position</th>
<th>Nature of Position</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas A&amp;M</td>
<td>Professor</td>
<td>Teaching/Research</td>
<td>1/02 - present</td>
</tr>
<tr>
<td>Texas A&amp;M</td>
<td>Professor &amp; Head</td>
<td>Administration</td>
<td>1/94 - 1/02</td>
</tr>
<tr>
<td>IA State Univ.</td>
<td>Professor &amp; Head</td>
<td>Administration</td>
<td>11/88-1/94</td>
</tr>
<tr>
<td>Univ. of NE</td>
<td>Interim Head</td>
<td>Administration</td>
<td>2/88-11/88</td>
</tr>
<tr>
<td>Univ. of NE</td>
<td>Professor</td>
<td>Research/Teaching</td>
<td>7/81-2/88</td>
</tr>
<tr>
<td>Univ. of NE</td>
<td>Associate Professor</td>
<td>Research/Teaching</td>
<td>1/75-7/81</td>
</tr>
<tr>
<td>Univ. of MN</td>
<td>Assistant Professor</td>
<td>Teaching/Research</td>
<td>1/72-1/75</td>
</tr>
<tr>
<td>Univ. of MN</td>
<td>Instructor</td>
<td>Teaching/Research</td>
<td>9/68-1/72</td>
</tr>
<tr>
<td>CO State Univ.</td>
<td>Research Fellow</td>
<td>Research</td>
<td>6/66-9/68</td>
</tr>
</tbody>
</table>

PUBLICATIONS


CARMEN L. GOMES
Assistant Professor

EDUCATION:
Ph.D. Biological and Agricultural Engineering, Biological and Agricultural Engineering Department (BAEN), Texas A&M University, College Station, TX, May 2010.
B.S. Food Engineering, Department of Food Engineering, Federal University of Vicosota, Vicosota, Brazil, August 2002.

EXPERIENCE:
Assistant Professor, BAEN, Texas A&M University, 8/2010-Present.

HONORS AND AWARDS
2013 – Excellence in Teaching Award, Biological and Agricultural Engineering Department
2012 – ASABE Professor of the Year Award - BAEN department
2011 – ADVANCE scholar – Texas A&M University ADVANCE Center for Women Faculty (NSF).
   Mentor Dr. Joanne Lupton.
2009 - Ethel Ashworth-Tsutsui Memorial – Research Excellence Award Recipient, Texas A&M University.
2006 - Bill & Rita Stout International Graduate Award - established to recognize outstanding achievement by international graduate students in BAEN Department at Texas A&M University.

SOCIETY MEMBERSHIP:
• Institute of Food Technologists (IFT)
• American Society of Biological and Agricultural Engineers (ASABE)
• Alpha Epsilon, the Honor Society of Agricultural, Food and Biological Engineering
• Gamma Sigma Delta, the Honor Society of Agriculture
• Phi Tau Sigma, the Honor Society of Food Scientists
• Pinnacle National honor society, the non-traditional honor society

OUTREACH /MENTORING/SERVICE:
• Outreach and Mentoring programs: Women in Science and Engineering (WISE - board of directors since 2007), Sloan Foundation Minority Ph.D. Program Faculty mentor (since 2011), WISE annual conference (organizer since 2007), Expanding Your Horizon 6th grade conference (since 2007), Science Café (organizer since 2008).
• **New course** (graduate level): BAEN/FSTC/ANSC 689 engineering and scientific aspects of nanotechnology applications for food processing – offered Fall 2012 also distance education.

**PUBLICATIONS IN REFEREED JOURNALS IN THE LAST FIVE YEARS:**


TERRY A. HOWELL  
WRE Research Leader (Supervisory Agricultural Engineer)

USDA-Agricultural Research Service  
Bushland, Texas  
Conservation and Production Research Laboratory  
P.O. Drawer 10  
2300 Experiment Station Rd. (shipping) Bushland,  
TX 79012-0010  
(806) 356-5746 (Voice) / (806) 356-5750 (Fax)  
Terry.Howell@ars.usda.gov http://www.cprl.ars.usda.gov

Overview of Irrigation Program
Leads the Soil and Water Management Research Unit responsible for enhancing the creativity/productivity of the Unit. Research assignment is to evaluate and quantify the water use in dryland and irrigated agriculture in the semiarid, advective environment of the U.S. Southern High Plains and to conserve ground water and to enhance capture and effectiveness of precipitation. Personal research goals are to improve ET estimation in a highly advective environment, to improve irrigation effectiveness, and to evaluate and develop advanced irrigation technologies suitable to this region.

Irrigation Research and Education Interests:
- Evapotranspiration models and use for irrigation scheduling and water resource management
- Energy and soil water balance in semi-arid environments
- Micrometeorology
- Remote sensing for water management
- Irrigation application technology (sprinkler, subsurface drip irrigation)
- Crop development/growth models

Significant contributions to irrigation research and education
- Irrigation scheduling concepts based on direct crop water status measurements
- Design theory for drip irrigation laterals;
- Improved understanding of crop yield water relationships;
- Use of remote weather stations to provide real-time irrigation scheduling information;
- Improved weighing lysimeter designs for both reconstructed soil profiles and monolithic soil profiles;
- Recognition of the importance of advective influences on evaporation in the Southern Great Plains;
- Improved understanding of the dynamics of irrigation application and efficiency of center pivot and lateral move sprinkler systems with various application methods (low energy, precision application, low pressure spray, and other spray head and impact sprinkler devices);
- Co-founded the Texas High Plains Evapotranspiration Network.

Selected Recent Irrigation Publications:

Education:
- Ph.D., Agricultural Engineering, Texas A&M University, 1974
- M.S., Agricultural Engineering, Texas A&M University, 1970
- B.S., Agricultural Engineering, Texas A&M University, 1969

Professional Licenses, Certifications, etc.:
- Professional Engineer, State of Texas, No. 43797
- Diplomate, American Academy of Water Resource Engineers

Professional Societies, Affiliations:
- American Academy of Water Resources Engineers (Diplomate)
- American Society of Agricultural and Biological Engineers (Fellow)
- American Society of Agronomy (Fellow)
- American Society of Civil Engineers (Fellow)
- Central Plains Irrigation Association
- Council for Agricultural Science and Technology
- Groundwater Foundation
- Irrigation Association (Life Member)
- Soil Science Society of America (Fellow)
- Sorghum Improvement Conference of North America
- Texas Agricultural Irrigation Association
- Texas Turf Irrigation Association
- U.S. Committee on Irrigation and Drainage

Additional Responsibilities and Capabilities:
- Adjunct Professor, Biological and Agricultural Engineering Department, Texas A&M University
- Adjunct Professor, Biological Systems Engineering Department, University of Nebraska-Lincoln

Major Irrigation Honors and Awards:
- Person of the Year, Irrigation Association, 1995
- Royce J. Tipton Award, American Society of Civil Engineers, 1998
• Hancor Soil and Water Engineering Award, American Society of Agricultural and Biological Engineers, 2000
• Dale F. Heermann Sprinkler Irrigation Award, American Society of Agricultural and Biological Engineers, 2008
• John Deere Gold Medal, American Society of Agricultural and Biological Engineers, 2008
FOUAD H. JABER, PHD, PE
Associate Professor and Water Resources Extension Specialist

Biological and Agricultural Engineering Department
Texas A&M AgriLife
17360 Coit Road, Dallas, TX 75252
Phone: (972) 952-9672 Fax: (972) 952-9216 Email: f-jaber@tamu.edu

Education
Ph.D. Agricultural and Biological Engineering, Purdue University, 2001
M.S. Irrigation, American University of Beirut (Lebanon), 1995
B.S. Agriculture American University of Beirut (Lebanon), 1992
Diplome “Ingenieur Agricole”, American University of Beirut (Lebanon), 1992

Research and extension interests
My activities aim at developing outreach and research plans in water resources management to sustainably meet future water needs and protect the environment. My specific areas of expertise include, surface water resources and stormwater management; evaluation of the effect of water quantity and quality interactions on the water resources as watershed management programs are implemented; evaluation of stream processes and hydraulics to foster implementation of stream restoration programming; prediction of availability and sustainability of water resources.

Professional experience
• Associate Professor/Extension Specialist, Texas A&M University, 2014-present
• Registered Professional Engineer license #112968
• Assistant Professor/Extension Specialist, Texas A&M University, 2007-2014
• Environmental Science and Engineering Institute Fellow, Purdue University, 1999 – 2001.
• Teaching Assistant, Purdue University, 1997-1998.
• Research Assistant, American University of Beirut, Beirut, Lebanon, 1992 – 1994

Refereed publications
Jaber F. H. and Shukla S. 2013. MIKE SHE: Model use, Calibration and Validation. Transactions of the ASABE. (In press)

Other publications
• 2 refereed conference proceedings
• 42 conference papers and abstracts
• 7 governmental reports
• 12 extension publications

Past Grants/contracts funded
• Rain gardens as a stormwater best management practice at Myers Park, Collin County. TCEQ trinity river initiative. $8000. FY09
• Upper trinity watershed green building infrastructure for stormwater management. TCEQ/EPA 319h grant. $644,400. FY10
• Green infrastructure for greywater and a/c condensation reuse. Qatar national research fund- national priorities research program. $491,045 ($279,545 for my program) FY10
• Modeling Low Impact Development for Optimal Performance in Texas Coastal Zones. Texas Sea Grant. $189,595. FY12.
• City of McKinney Stream Restoration Program. $100,000. FY11.
Awards

- Blue Ribbon Award for best extension publication. ASABE 2011. Louisville, KY.
- Magoon Award for Excellence in Teaching in Engineering, Purdue University, May 1998.
JAEHAK JEONG
Assistant Professor

EDUCATION:
Ph.D. (Civil Engineering), University of Texas at Austin, 2008
M.S. (Civil Engineering), University of Texas at Austin, 2004
B.E. (Civil Engineering), Korea University, Seoul, Korea, 2000

TEXAS A&M UNIVERSITY EMPLOYMENT:
Assistant Professor, Biological and Agricultural Engineering, Texas A&M University, 2012-
Assistant Professor, Blackland Research Center, Texas A&M AgriLife Research, 2012-
Assistant Research Scientist, Blackland Research Center, Texas A&M AgriLife Research, 2010-2012
Postdoctoral Research Associate, Blackland Research Center, Texas A&M AgriLife Research, 2008-2010

REGISTRATION:
Professional Engineer in the state of Texas, No.102144

SERVICES & APPOINTMENTS:
Adjunct Assistant Professor, Energy & Environmental Systems Department, North Carolina A&T
University, Greensboro, NC, 2014-2018
Honorary Research Advisor, Korean Rural Development Administration, South Korea, 2013-2015
Member, Graduate Committee, BAEN, Texas A&M University, Ph.D Candidate, Mijin Seo (Graduated,
2014 December)

PROFESSIONAL DEVELOPMENT AND ACTIVITIES (last 5 years):
• Workshop on Integrated Decision Support System, Bahir Dar, Ethiopia, February 2-6, 2015
• “Environmental Assessment of the National Conservation Programs in U.S. Croplands” Texas
A&M University Fall 2014 Interdisciplinary Lecture Series, College Station, Texas, September
17, 2014
Ababa, Ethiopia
• ArcSWAT Training Workshop, November 2, 2013, Preconference workshop at the 2013 AWRA
Conference, Portland, Oregon
• ArcAPEX Training, Texas A&M University, College Station, TX, June 5-6, 2013
• APEX Training Course for Grazing Land Modeling, Temple, TX, April 1-3,2013
• CRP1.1 Meeting on Support Research Methods for the CGIAR Research Program 1.1 Dryland
Systems hosted by International Center for Agricultural Research in the Dry Areas (ICARDA),
University of Reading, Reading, UK, Nov. 26-28 2012
• SWAT Workshop for Beginners and Advanced Users, Preconference workshop, 21St Watershed
Technology Conference and Workshop, Bari, Italy, May 26-27, 2012
• Urban Watershed Modeling, Training workshop, Jacobs Engineering, Dallas, Texas, October 28,
2011
PRINCIPAL PUBLICATIONS (selected from last 5 years of 25):

- H. Yen, J. Jeong, S. Lu, M. Kim, Y. Su “Assessment of Model Configuration Effect by Alternative Evapotranspiration, Runoff, and Water Routing Functions on Watershed Modeling Using SWAT” Transactions of the ASABE (Accepted)

PROFESSIONAL AFFILIATION AND SERVICES:
Member, American Society of Agricultural and Biological Engineers, 2012-
Member, American Water Resources Association, 2012-
Associate Editor, Journal of the American Water Resources Association, 2014-
Associate Editor, Journal of Environmental Quality, 2014
Scientific Committee Member, International SWAT Conference, 2010-
Scientific Committee Member, 21st Century Watershed Technology, 2013-
ANISH R. JANTRANIA
Associate Professor

EDUCATION:

TEXAS A&M UNIVERSITY SYSTEM EMPLOYMENT:
Associate Professor/Extension Specialist, Biological and Agricultural Engineering/AgriLife Research and Extension, Texas A&M University System, August 2014 – Present.

PREVIOUS EMPLOYMENT:

REGISTRATION:
Registered Professional Engineer, Texas, Virginia, Massachusetts, and West Virginia.

NOTEWORTHY UNDERTAKINGS:
Developed and field tested a subsurface effluent dispersal system that would operate in heavy clay soil exhibiting shrink-swell characteristics; Completed a number of decentralized wastewater system projects specifically designed to benefit low-moderate income families in Virginia; Co-authored a text book on advanced onsite wastewater systems technologies; Managed multi-year state funded research program in Virginia specifically designed to develop regulatory standards for onsite wastewater systems; Participated and lead efforts to revise state regulations for onsite systems in Virginia; Offered technical guidance and supervision to City of Gloucester, Massachusetts on design and construction of onsite systems and small diameter pressure sewer; Managed the first National Onsite Demonstration Project funded by U.S. Environmental Protection agency designed to test efficacy of advanced onsite treatment systems;
PUBLICATIONS (PARTIAL LIST):

PROFESSIONAL AFFILIATIONS:
Registered Professional Engineer in Texas, Virginia, Massachusetts, and West Virginia; Elected at-large board member, National Rural Community Assistance Partnership (RCAP) Board;
Member of the review team for Journal of the American Water Resources Association (JAWRA) and American Society of Agricultural and Biological Engineers (ASABE); Member of WERF sub-committee to select research team and review research programs; Served on the Technical Committee for revising the US EPA On-Site Design Manual; Founding Member of the Editorial Review Board for the Small Flows Journal;
Member of the Project Subcommittee for the National Sanitation Foundation (NSF); Member of the Primary Committee for the National Onsite Wastewater Recycling Association (NOWRA) National Model Code;
Elected on Board of Directors of the National Onsite Wastewater Recycling Association (1999-2001); and
Member of Texas, Virginia, and National Onsite Wastewater Recycling Association.
R. Karthikeyan, Ph.D.
Associate Professor, Biological and Agricultural Engineering Department,
2117 TAMU, Texas A&M University, College Station, TX 77843-2117
karthi@tamu.edu; (979)845-7951; http://baen.tamu.edu/people/karthikeyan-r/

Education
Ph.D., Engineering, Kansas State University, Manhattan, KS, [2001]
M.S., Agricultural Engineering, The University of Georgia, Athens, GA, [1997]
B.E., Agricultural Engineering, Tamil Nadu Agricultural University, Coimbatore, India 1993

Professional Experience
Associate Professor
Biological and Agricultural Engineering Department, Texas A&M University, [2011-present]
Assistant Professor
Biological and Agricultural Engineering Department, Texas A&M University, [2005-2011]
Postdoctoral Research Associate
Non-lethal Environ. Evaluation and Remediation Center, Kansas State University, [2001-2005]

Research Products
Refereed Publications
Note: *denotes graduate students supervised by Dr. Karthikeyan


Computer Simulation Model

Professional Society Membership and Service
American Society of Agricultural and Biological Engineers (ASABE) [2005-present]
Associate Editor
Transactions of ASABE; Applied Engineering in Agriculture; Biological Engineering Transactions

Awards and Honors
- Dean's Outstanding Achievement Award for Interdisciplinary Research, [2014]
- Wakonse Teaching Fellow, Wakonse Foundation, [2014]
- Neuhaus-Shepardson Faculty Fellowship, [2013]
- Excellence in Research Award, Biological and Agricultural Engineering, [2014]
- Honorable Mention Paper Award, ASABE, [2011]
- BP Teaching Excellence Award, College of Engineering, [2010-2011]
- Montague Teaching Scholar, Center for Teaching Excellence, [2009-2010]
ANN KENIMER
Associate Provost for Undergraduate Studies

EDUCATION
- Ph.D., Agricultural Engineering, University of Illinois at Urbana-Champaign, 1990
- M.S., Agricultural Engineering, Virginia Polytechnic Institute and State University, 1987
- B.S., Agricultural Engineering, Virginia Polytechnic Institute and State University, 1985

ACADEMIC EXPERIENCE

Associate Provost for Undergraduate Studies, Texas A&M University, 2012-present

Associate Dean of Faculties, Texas A&M University, 2011-12

Associate Dean for Academic Operations, College of Agriculture and Life Sciences, Texas A&M University, 2007-11

Interim Executive Associate Dean, College of Agriculture and Life Sciences, Texas A&M University, 2008-09

Professor, Department of Biological and Agricultural Engineering, 1993-present
- Appointed as assistant professor August 1993, promoted to associate professor with tenure September 1999, promoted to professor September 2005

NON-ACADEMIC EXPERIENCE

- Engineering consultation related to stormwater management, wetlands mitigation, and associated permitting

PROFESSIONAL REGISTRATION
- Professional Engineer, State of Texas, 83493

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
- ASABE, 1984-present
- AAC&U (Association of American Colleges and Universities), American Conference on Academic Deans

HONORS AND AWARDS

National Level
- Exemplary Teacher, National Case Study of Learner-Centered Approaches in Colleges of Agriculture, Food, and Natural Resources, 2003-05
- A. W. Farrall Young Educator Award, ASABE, 2001
• Superior Paper Award, ASABE, 1990

**State Level**
• Minnie Stevens Piper Professor, Minnie Stevens Piper Foundation, 2007

**University Level**
• Presidential Professor for Teaching Excellence, Texas A&M University, 2006
• Association of Former Students Distinguished Teaching Award, Texas A&M University, 2006
• CTE Faculty Teaching Academy Professor, Texas A&M University Center for Teaching Excellence, 2005-06
• Finalist, Presidential Professor for Teaching Excellence, Texas A&M University, 2005

**College Level**
• College of Agriculture and Life Sciences Outstanding Alumna, Biological Systems Engineering, Virginia Tech, 2008-09
• Association of Former Students Distinguished Teaching Award, College of Agriculture and Life Sciences, 2005
• 2004 Vice Chancellor’s Award for Excellence in Undergraduate Teaching, College of Agriculture and Life Sciences, Texas A&M University
• Association of Former Students Distinguished Teaching Award, Dwight Look College of Engineering, 1998
• Montague-Center for Teaching Excellence Scholar, College of Agriculture and Life Sciences, 1998-99

**Department Level**
• Graduate Assistant Teaching Excellence Award, Department of Agricultural Engineering, University of Illinois at Urbana-Champaign, 1989

**SERVICE**

**Engineering Accreditation Commission, ABET**
• EAC Executive Committee, 2011-present
• Lead Facilitator for Program Evaluator Candidate Training, 2013-present
• Support Facilitator for Program Evaluator Candidate Training, 2011-present
• EAC Commissioner, 2007-2011
• Program Evaluator, 2003-07

**ASABE, 1984-present**
• ASABE Foundation Board of Trustees, 2011-present
• Board of Trustees, 2008-10
• P-204 Accreditation Committee, 2003-present
RONALD E. LACEY  
Professor

EDUCATION:
- B.S.  Agricultural Engineering  University of Kentucky  1977
- M.S.  Agricultural Engineering  University of Kentucky  1979
- Ph.D.  Agricultural Engineering  University of Kentucky  1992

TAMU FACULTY EMPLOYMENT:
- 22 years on this faculty; Initial Appointment: October 1, 1992
  Professor, 1998 – present, Biological & Agricultural Engineering
  Associate Professor, 1998 – 2004, Biological & Agricultural Engineering
  Assistant Professor, 1992 – 1998, Agricultural Engineering

OTHER PROFESSIONAL EMPLOYMENT:
- Director of Engineering Services  1988-1990  Taco Bell, Inc., Irvine, CA
- Manager of Mechanical Engineering  1985-1988  Taco Bell, Inc., Irvine, CA
- Mechanical Engineer  1983-1985  Pizza Hut, Inc., Wichita, KS
- R&D Process Engineer  1981-1983  The Pillsbury Company, Minneapolis, MN

STATES REGISTERED AS PROFESSIONAL ENGINEER:
- State of Texas, License Number 86580

PRINCIPAL PUBLICATIONS OF THE LAST FIVE YEARS:

Zhang, H., Y. Lan, C. W. Hoffmann, and R. E. Lacey. 2014. Multisensor fusion of chlorophyll meter readings and hyperspectral measurements and airborne imagery in the detection of nitrogen status on crop. *Transactions of the ASABE*

**SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH A MEMBER:**
American Society of Agricultural and Biological Engineers (ASABE)

**HONORS AND AWARDS IN THE LAST FIVE YEARS:**
2010 Texas Environmental Excellence Award from the Texas Commission on Environmental Quality awarded to the Air Quality: Reducing Emissions from Cattle Feedlots and Dairies research team of which Dr. Lacey was a member.
Award for Excellence in Teaching, 2011, Biological and Agricultural Engineering Department
Award for Excellence in Service, 2014, Biological and Agricultural Engineering Department

**INSTITUTIONAL AND PROFESSIONAL SERVICE IN THE LAST FIVE YEARS:**
American Society of Agricultural and Biological Engineers (ASABE)
   - Member P-120 Student Organizations Committee, 2012-2013.
USDA SBIR Review Panel, 2014, Washington DC
USDA NIFA Review Panel, 2013, Washington DC
Member of Faculty of Molecular and Environmental Plant Science since 2005.
Faculty Mentor for Dr. Brock Faulkner, Assistant Professor, BAEN, since 2009 – 2014
Chair of BAEN Infrastructure Committee, since 2004

**PROFESSIONAL DEVELOPMENT ACTIVITIES IN THE LAST FIVE YEARS:**
 Participated in *First Responders: Using Feedback to Improve Student Writing*, July 26, 2013, Texas A&M University Writing Center.
Attended ASABE International meetings
BINAYAK P. MOHANTY
Professor

**Education**
1989-1992  Ph.D., Soil and Water Engineering (major) and Environmental Engineering (minor), Iowa State University, Ames, Iowa, USA
1986-1987  M.E., Soil and Water Engineering (major) and Water Resources Engineering (minor), Asian Institute of Technology, Bangkok, Thailand
1981-1985  B.Sc., Agricultural Engineering and Technology, Orissa University of Agriculture & Technology, Bhubaneswar, India

**Positions**
2014-  Regents Professor and College of Agriculture and Life Sciences (CoALS) Chair in Hydrologic Engineering and Sciences, Texas A&M University, College Station
2004-2014  Professor (Hydrology), Depts. of Biological and Agricultural Engineering and Ecosystem Science and Management, Texas A&M University, College Station
2001-2004  Associate Professor (Hydrology), Depts. of Biological and Agricultural Engineering and Ecosystem Science and Management, Texas A&M University, College Station
1993-2001  Associate, Assistant, and Post-Doctoral Researcher, Dept. of Environmental Sciences, University of California, Riverside; located at U. S. Salinity Laboratory, USDA-ARS

**Selected Honors and Awards**
2014  Don and Betty Kirkham Soil Physics Award, Soil Science Society of America (SSSA)
2014  Regents Professor, Texas A&M University System
2014  Inaugural Holder of College of Agriculture and Life Sciences (CoALS) Chair in Hydrologic Engineering and Sciences, Texas A&M University
2014  TEES Senior Fellow, Texas A&M Engineering
2013  NASA Group Achievement Award for a Successful Pre-Launch Field Campaign (SMAPVEX12) in Manitoba, Canada, in Support of SMAP Algorithm and Applications Development
2013, 14  Protégé, The Academy of Medicine, Engineering, and Science of Texas (TAMEST)
2012  Fellow, Soil Science Society of America (SSSA) & Agronomy Society of America (ASA)
2012  Fellow, Texas AgriLife Research

**Significant Professional Activities**
- **PI, Co-PI, and Co-I of 35+ Competitive National and International Grants Totaling ~ US $ 55 million**
- **Membership:** American Geophysical Union (AGU); Soil Science Society of America (SSSA); Agronomy Society of America (ASA); American Meteorological Society (AMS); American Association for the Advancement of Science (AAAS); also member of Interdisciplinary Water Management and Hydrologic Sciences (WMHS) Program and Institute for Scientific Computing (ISC) at Texas A&M University
• Participant: NASA Soil Moisture Working Group (1996-Present)
• Organizing Committee Gordon research Conference in Flow and Transport in Porous Media (2008)
• CUAHSI Texas A&M University Representative, 2007-
• Member, Organizing Committee, 2014 Texas Water Summit, The Academy of Medicine, Engineering, and Science of Texas (TAMEST) (2013-2014)
• Chairman, Symposium/Workshop on Arid Zone Hydrology under Climate Change Scenarios for the 21st Century, Institute of Applied Mathematics and Computational Science (IAMCS), Texas A&M University (2014)

Journal Papers since 2010 (Career Total – 100+)
[* indicates graduate student or postdoc under my supervision]


RABI H. MOHTAR
Professor

CAREER GOALS, PHILOSOPHY, PRIORITIES

Improve the understanding of the role of the natural system in changing societal and professional landscapes; shape young minds toward a sustainable, global infrastructure and environment.

Effective programs and institutions are based on empowering people to take ownership of roles and actions, fostering creativity, interdisciplinarity and systems approaches to problem solving, and leading by example. The key challenge facing our society is sustainable development. Addressing increasing water, energy and food demands and environmental degradation requires us to focus on conservation of natural resources of land, water, air, and biodiversity. Education must address the diverse nature of students and subjects taught and include active learning experiences to develop new skills and change behavior. Global education and educational institutions must provide graduates with opportunities for professional, personal, and technical global experiences and instill a sense of global social responsibility.

EDUCATION

1994 Michigan State University, Ph.D., Agricultural Technology and Systems Management, Dynamic Time Step Estimates for Transient Field Problems

1992 Michigan State University, M.Sc., Civil and Environmental Engineering, Finite Element Analysis of the Air Sparging Problem

1983 American University of Beirut, Beirut, Lebanon, Diploma of Agricultural Engineering, B.Sc. in Agricultural Sciences, M.Sc., Irrigation Science, A Model for the Design and Optimization of Branched Pipe Networks

PROFESSIONAL EXPERIENCE

July 2013 – Present TEES Endowed Research Professor, Texas AM University, Biological Agricultural Engineering, Civil Engineering, Water Management and Hydrologic Sciences Faculty. Teaching and research in the Water- Energy- Food nexus and its policy implications

July 2013 – Present Adjunct Professor Purdue University

July 2013 – Present Adjunct Professor, Texas AM-Qatar

June 2013 – Jan. 2013 Executive Director, Strategic Projects, Qatar Foundation. Advise President of R&D, Qatar Foundation on strategies and operations of National Research Strategy and Research Grand Challenges.

2011 – 2013 Founding Executive Director, Qatar Environment and Energy Research Institute, Qatar Foundation. Developed strategic and business plan, engaged collaboration with Qatari and Qatar Foundation entities, including Texas A&M University–Qatar, Carnegie Mellon University–Qatar, Qatar National Research Fund.

1996 – 2013 Purdue University, Professor, Agricultural and Biological Engineering Department, Environmental & Natural Resources Engineering Program
Teaching and research on soil water resource conservation engineering, applications of numerical methods to agricultural and biological engineering systems; Inaugural Director, Global Engineering Program, Facilitator, College of Engineering Water Initiative, Purdue Water Community Executive Committee

SELECTED HONORARY SOCIETIES, AWARDS

Honors and Awards
Kishida International Award, ASABE 2010
AUB-FAFS Distinguished Alumni 2013

PROFESSIONAL SOCIETIES
American Society of Agricultural Engineers
American Society of Engineering Education
American Lebanese Engineering Society License for Engineering Practice (Order of Engineers and Architects, Lebanon)
European Geophysical Union

SELECTED PROFESSIONAL LEADERSHIP AND SERVICE (SINCE 2010)
Advisory Panel, Momentum for Change initiative, UNFCCC secretariat
Member, Decision Theater Room (DTR) steering committee. QN SP
Member, International Water Resources Association (IWRA) Publications committee
Member, World Water Council, Board of Governance
Member, Science and Technology Commission, 7th World Water Forum.
Member, Water External Advisory Board, University of Alberta
Member, Global Agenda Council on Climate Change, World Economic Forum
Editor, Special Issue, Computers and Electronics in Agriculture: Multi-scale water and land-use modeling in support for better decision making
Member, Qatar National Research Fund Steering Committee
Member, International Advisory Board, Bloomsbury Qatar Foundation Journals (Q-Science)
Member, Nominating Committee, Founding Committee for the MENA NWC (Middle East and North Africa Network of Water Centers of Excellence)
Qatar representative, GCC Alternative Energy Network
Co-chair, Environment and Energy Research Panel, Qatar National Research Strategy, Blue Ribbon Panel Group
Member, Editorial Board, Journal of Sustainable Watershed Science and Management
Board Member, Society for the Advancement of Sciences and technology in the Arab World (SASTA)
Member, Global Agenda Council on Water Security, World Economic Forum
GRADUATE STUDENTS:
37 Postdocs
31 PhD
16 MSc/MSE
37 Senior Design

SELECTED PEER REVIEWED PUBLICATIONS, CHAPTERS
(OVER 200 PEER REVIEWED/REFEREED JOURNAL ARTICLES/PROCEEDINGS)


SELECTED INVITED SEMINARS AND PRESENTATIONS
Fifth Clean Energy Ministerial (CEM5), Korea, 2014
3rd Session, General Assembly Open Working Group on Sustainable Development Goals, 2013
International Herald tribune global clean energy forum, Keynote water-energy-food nexus, 2013
5th IRENA council, 2013, Abu Dhabi
Beirut energy forum. Keynote: regional and international sustainability initiatives for the Arab world. 2012.
Who and What drives climate change in the Arab World. CIRS, Georgetown and Issam Faris Institute (AUB). Doha. 2012.
6th World Water Forum, France. 2012

SELECTED CONFERENCES, WORKSHOPS ORGANIZED AND CONDUCTED
First International Conference on Energy and Indoor Environments in Hot Climates. Doha, 2014
6th international conference on Environmental mutagens in human populations. Doha, 2012,
Doha Carbon and Energy Forum Steering committee 2013
Eco-Q, Qatar International Environment protection exhibition. Doha, 2011
Engineering Competency and Global Design Team, at World Congress on Engineering Education. Doha 2013.
Annual Research Forum / Arab Expat Scientists, Scientific committee. Doha 2012.

OTHER SELECTED INTERNATIONAL ACTIVITIES
Mohtar’s interest in international development helped define his personal and professional journey. Key roles have impacted individuals and groups worldwide. Selected examples include:
Jordan - multi-year, multi-institutional USAID project provided training for water resource professionals, Ministry of Water and Irrigation.
Gaza/West Bank - developed a water science and engineering curriculum, identified research needs/priorities for regional water issues, initiated MSc Program, Islamic University-Gaza: distance learning technologies, regional outreach activities, training those working directly with water quality management.
Tunisia - USDA-FAS workshop: dryland hydrology; over 30 regional participants from government and academia. Outcomes included invitation from US National Academies to help organize a workshop in Tunisia to address the linkage between water, science, decision making.

Lebanon - advised local community on water harvesting site selection, design implemented by the Canadian development agency. Purdue global initiative grant and AUB Research Board enabled co-advising two AUB MSc students on water harvesting and grazing modeling; hosted three summer faculty sabbaticals at Purdue.

France - developed state-of-the-art technology in soil water modeling that has improved the way researchers characterize and model soil water Kamel®, a dual permeability, non-rigid, soil water model, currently adopted by the European Union project SEAMLESS, (System for Environmental and Agricultural Modeling: Linking European Science and Society)
ROSANA GALVES MOREIRA
Professor

EDUCATION:
B.S., Agricultural Engineering, University of Campinas, Brazil, 1980
M.S., Agricultural Engineering, Michigan State University, 1983
Ph.D., Agricultural Engineering, Michigan State University, 1989

TEXAS A&M UNIVERSITY EMPLOYMENT:
- 21 years on this faculty, Initial appointment: May, 1993
- Assistant Provost for Graduate and Professional Studies, September 2014 to present
- Assistant Provost – ADVANCE Administration Fellow, February 2020 to August 2014
- Assistant Department Head, Biological and Agricultural Engineering Dept., September 2007 to August 2014
- Professor, Biological and Agricultural Engineering Dept., 2003 to present
- Associate Professor, Biological and Agricultural Engineering Dept., 1998-2003
- Assistant Professor, Biological and Agricultural Engineering Dept., 1993-1998
- Director, Center for Food Processing & Engineering, Institute of Food Science and Engineering, 2004-2005

OTHER PROFESSIONAL EMPLOYMENT:
- Visiting Specialist, Department of Agricultural Engineering, Michigan State University, January 1989 to August 1990

REGISTRATION:
Registered Professional Engineer, State of Texas, No. 74517

PRINCIPAL PUBLICATIONS (Last 5 years):
5. Sevimli Yurttas, Z., Moreira, R.G., Castell-Perez, M.E. 2014. Combined vacuum impregnation and electron-beam irradiation treatment to extend the storage life of sliced white button


Book Chapters:


SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:
• American Society of Agricultural and Biological Engineers (ASABE)
• Institute of Food Technologists (IFT)

HONORS AND AWARDS:
• 2014 IFT Outstanding Service Award, Food Engineering Division
• 2013-14 TAMU SEC-ALDP Fellow, SEC Academic Leadership Development Program (ALDP)
• 2013 IFT Fellow
• 2013 Dean's Outstanding Achievement Awards for Service, College of Agriculture and Life Sciences (COALS)
• 2013 William Keeler Faculty Fellow, Dwight Look College of Engineering
• 2012-2013 ADVANCE Administrative Fellowship
• 2011-2012 Charles Crawford Distinguished Service Award, Dwight Look College of Engineering
• 2011 Hans Merensky Fellow, the Hans Merensky Foundation, South Africa
• 2010 IFT Food Engineering Division Volunteer Award
• 2010 BAEN Department Award for Excellence in Service
• 2006 COALS Faculty fellow
• 2006 Dwight Look College of Engineering Fellow
• 2005 Ethel Ashworth-Tsutsui Memorial Lecturer, Texas A&M
• 1993-1944 Montague Center for Teaching Excellence Award
• Alpha Epsilon Agricultural Engineering Society
• Phi Beta Delta International Scholar Honor Society
• Gamma Sigma Delta Agriculture Honor Society

INSTITUTIONAL AND PROFESSIONAL SERVICE (Last 5 years):

Editorial:

   b. Editorial Board: Journal of Food Quality (2000-present)

Professional Society:
• IFT:
  a. Member at Large, Food Engineering Division, 2002 to 2004; 2004 to 2007
  b. Web and newsletter Editor for the Food Engineering Division of the IFT, 2007 to 2011
  c. Past Chair, Chair, Chair-elect and Secretary of Food Engineering Division (2005-2008)
  d. Core-Science (Food Engineering) Subpanel Chair, 2009-2010

Department:

a. Assistant Department Head for Recruiting and Distance Education, 2007 to 2014
b. Director of Distance Education program, 2010-2014
c. Graduate Coordinator, 2002 to 2012
d. Communications and Marketing Committee (Chair 2010-2014; member 2014)
e. Advisor of AGSM Student Club (2013-2015)

Texas A&M:

a. Member of the ADVANCE Scholar Team, VP for Diversity, 2011 to present
b. Member of TAMU’s Women Engineering Faculty Interest Group (WEFIG) (2005 to present)
c. Member of the ADVANCE Recognition Committee, 2011 to present
d. Shared Services Committee, 2010 to 2012
e. University Grievance Committee (UGC) Member, 2009 to 2010
f. Graduate Program Council (GPC) Member, 2002 to 2012
g. Graduate Instructional Committee (GIC) Member, 2002 to 2012
h. STEW - Summer Transfer Engineering Workshop, 2009 to present
i. Promotion and Tenure Committee Member – COALS, 2008 to 2009
j. Engineering Faculty Advisory Council Member, EFAC, 2006 to 2009

Other:

- Appointed by the Governor of Texas as a member of the Texas Radiation Advisory Board, 2006 – 2013
- Panelist member for review of the 2013 USDA/NIFA - Nanotechnology for Agriculture and Food Systems program, April 2013

PROFESSIONAL DEVELOPMENT ACTIVITIES (Last 5 years):

- Attended IFT Meetings
- Attended SEC Academic Leadership Conferences, 2013-14

Continuing education:

c. Difficult Dialogues Workshop # 2. Fifth Module. October 2013
d. Difficult Dialogues Workshop sponsored by the VP of Diversity. Four Modules. (February-March 2013)
e. Mediation Training Workshop, January 2013
SAQIB MUKHTAR
Professor

EDUCATION
May 1989  Ph.D. in Agricultural Engineering with a Minor in Water Resources. Iowa State University.
Dissertation: Soil Aeration and Crop Growth in Response to Excess Water.
May 1984  M.S. in Agricultural Engineering. Iowa State University.

EXPERIENCE
-Associate Department Head and Extension Program Leader for Biological and Agricultural Engineering. Texas A&M AgriLife Extension (February 2012-present).
-Associate Department Head and Extension Program Leader for Biological and Agricultural Engineering. Texas A&M AgriLife Extension (November 2010-Present, Interim from November, 2010 - Jan 2012).
-Professor and Extension Agricultural Engineer. Texas A&M AgriLife Extension and Research, College Station, Texas (September 2010-present).

PROFESSIONAL REGISTRATION
Licensed Professional Engineer, State of Texas, Registration Number: 90744.

PAST POSITIONS
-Associate Professor and Extension Agricultural Engineer. Texas A&M AgriLife Extension and Research, College Station, Texas (September 2004-August 2010). Assistant Professor and -- Extension Agricultural Engineer. Texas A&M AgriLife Extension and Research, College Station, Texas (August 1998-August 2004).

REFEREED JOURNAL PUBLICATIONS (Selected from 46 total)


* Graduate student or research associate.

AWARDS AND HONORS (Selected from 19 total)


2. Texas A&M University-Association of Former Students University-Level Distinguished Achievement Award for Extension, Outreach, Continuing Education and Professional Development. 2013.


4. The 2010 American Society of Agricultural and Biological Engineers (ASABE) G. B. Gunlogson Countryside Engineering Award for outstanding achievements and leadership through extension education and cutting-edge research in environmental quality management of animal production operations. June, 2010.
5. Texas A&M AgriLife Extension Service-Superior Service Award. Commendation for developing effective waste management education programs that successfully improve the profitability of dairy and poultry producers and their ability to fully comply with environmental regulations. January 2008.

PROFESSIONAL AND HONORARY SOCIETIES

- American Society of Agricultural and Biological Engineers.
- Gamma Sigma Delta (Honor Society of Agriculture)

2. CLYDE L. MUNSTER

<table>
<thead>
<tr>
<th>Education and Training</th>
<th>Biological and Agricultural Engineering</th>
</tr>
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<tbody>
<tr>
<td>Ph.D.</td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>M.S.</td>
<td>Virginia Polytechnic Inst. &amp; State Univ.</td>
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<tr>
<td>B.S.</td>
<td>Virginia Polytechnic Inst. &amp; State Univ.</td>
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<tr>
<th>Research and Professional Experience</th>
<th>Texas A&amp;M University</th>
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<tr>
<td>2006-Present</td>
<td>Professor, Biological &amp; Agricultural Engineering</td>
</tr>
<tr>
<td>1998-2006</td>
<td>Associate Professor, Agricultural Engineering</td>
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<tr>
<td>1992-1998</td>
<td>Assistant Professor, Agricultural Engineering</td>
</tr>
<tr>
<td>1992</td>
<td>Postdoctoral Research Assoc., Biological and Agricultural Engineering</td>
</tr>
<tr>
<td>1988-1992</td>
<td>Research Assistant, Biological and Agricultural Engineering</td>
</tr>
<tr>
<td>1982-1987</td>
<td>Senior Associate Engineer, Environmental Dept.</td>
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<td>1980-1982</td>
<td>Graduate Research Assistant</td>
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<tr>
<th>Synergistic Activities</th>
<th>Virginia Polytechnic Inst. &amp; State University</th>
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<tr>
<td>2005-Present</td>
<td>Study Abroad Director for the Environmental Science and Engineering Program to the Katholieke Universiteit of Leuven, Belgium, for the Biological and Agricultural Engineering Department at Texas A&amp;M University.</td>
</tr>
</tbody>
</table>
2005-Present  Alfred P. Sloan Foundation Program Director, Biological and Agricultural Engineering Department, Texas A&M University, Recruitment and development program for minority Ph.D. candidates.

2000 Jan.-July  Fulbright Fellow to the Katholieke Universiteit Leuven, Belgium

Professional Activities

Assessment of E. Coli pollution from failing OSSFs to Galveston Bay, 2012-2014, Texas General Land Office – Coastal Management Plan, $100,000, PI, Clyde Munster, co-PIs, John Jacob, Karthi Karthikeyan


Sustainable Feedstock Production for Bioenergy, 2013 – 2014, South Central Sun Grant Agency, $162,000, PI, Clyde Munster, co-PIs, Tony Provin, Kevin McInnes, Hailin Zhang


Nueces River Arundo Study, 2013 – 2014, Nueces River Authority, $6,000, PI, Clyde Munster

Honors and Awards

2011  College of Agriculture and Life Science Vice Chancellor’s Excellence Award for Team Research, Texas A&M University

2010  Bush Excellence Award for International Education, Texas A&M University

1994  Center for Teaching Excellence Scholar: College of Agriculture and Life Science, Texas A&M University

Refereed Journal Publications


ZIVKO L. NIKOLOV
Dow Professor

EDUCATION:
- Dipl. Eng. Food Engineering University of Novi Sad, Serbia 1977
- M.S. Chemical Engineering Iowa State University 1983
- Ph.D. Chemical Engineering Iowa State University 1986

TEXAS A&M UNIVERSITY EMPLOYMENT:
Dow Professor, Biological and Agricultural Engineering, 2002-present

OTHER PROFESSIONAL EMPLOYMENT:
Vice President 2001-2002 ProdiGene Inc., College Station, TX
Director 1999-2001 ProdiGene Inc., College Station, TX
Professor 1998-1999 Food Sci. (75%) and Ag & Biosystems Eng. (25%)
Iowa State University, Ames, IA
Assoc. Professor 1993-1998 Food Sci. (75%) and Ag & Biosystems Eng. (25%)
Iowa State University, Ames, IA
Assist. Professor 1987-1993 Food Sci. & Human Nutr. Iowa State University, Ames, IA
Senior Scientist 1986-1987 Michigan Biotechnology Institute, Lansing, MI

PROFESSIONAL REGISTRATION
Registered Professional Engineer, State of Texas, No. 95216

CONSULTING and PATENTS (last 5 years)
Pat Application 2009/050905, July 2009, Transformation of glycerol and cellulosic materials into high
energy fuels.
Philip Morris International Inc., Switzerland, Process cost analysis of antibody production from
transgenic tobacco, 2010-2011.
Syngenta Biotechnology Inc., Evaluation of process options for extraction and recovery of cellulases
expressed in transgenic plants, 2010.
ERA Biotech, Barcelona, Spain, Process design and simulation for producing therapeutics in
transgenic tobacco, 2005-2010

PRINCIPAL PUBLICATIONS (last 5 years)
production of an antibody fragment and malaria vaccine antigen from Chlamydomonas
Hood, C. N, Hood, K. R., Woodard, S. L., Deviah, S. P., Jeoh, T., Wilken, L. R., Nikolov, Z. L.,


SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH MEMBER:

- American Society of Agricultural Engineers (ASABE)
- Institute for Biological Engineering (IBE)
- American Chemical Society (ACS)
- International Society for Pharmaceutical Engineering (ISPE)

HONORS AND AWARDS:
Scientific Advisory Board, Infinite Enzymes, 2007 – present
Scientific Advisory Board, ERA Biotech, Spain, 2006-2010
Who’s Who in Science and Engineering
BAEN Research Award 2010
ADM Award for Best Publication in Engineering & Technology, American Oil Chemists Society, 1996
Visiting Professor, School of Chemical Engineering, State University of Campinas, Brazil, 1997 and 2005.
Academic Research Fellow, Kraft Foods, Inc., 1995
Visiting Professor, Department of Chemical Engineering, Federal University of Rio Grande do Sul, Brazil, 1992.

INSTITUTIONAL AND PROFESSIONAL SERVICE (5 yrs)
Editorial Board Member, Journal of Biotechnology and Bioengineering, 2014-present
Advisory Board, The National Center for Therapeutic Manufacturing, Texas A&M, 2012 - present
NSF/SBIR Panel, Biomedical Devices, 2014
Scientific Board Member of the 6th Central European Congress on Food, Serbia 2012
NSF-CBET Panel, Metabolic Engineering and Biofuels, 2010
Editorial Board Member, Brazilian Journal of Chemical Engineering 2003-2008
Editorial Board Member, Journal of Biological Engineering 2007 – present
Editorial Board Member: Acta Periodica Technologica, Serbia, 2003 – present
CALVIN B. PARNELL, JR.
Regents Professor and Cotton Engineering & Mechanization Chair

EDUCATION

<table>
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<tr>
<th>Degree</th>
<th>Field</th>
<th>Institution</th>
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<tr>
<td>Ph.D.</td>
<td>Environmental Systems Eng.</td>
<td>Clemson University</td>
<td>1970</td>
</tr>
<tr>
<td>M.S.</td>
<td>Agricultural Engineering</td>
<td>Clemson University</td>
<td>1965</td>
</tr>
<tr>
<td>B.S.</td>
<td>Agricultural Engineering</td>
<td>New Mexico State University</td>
<td>1964</td>
</tr>
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</table>

RECENT PROFESSIONAL EXPERIENCE

1978-present: Associate Professor/Professor/Regents Professor
Biological and Agricultural Engineering Department (BAEN), Texas A&M University
(TAMU), College Station, TX

2002-2014: Director of the Center for Agricultural Air Quality Engineering and Science (CAAQES)

2004-present: Inaugural holder of the Cotton Engineering, Ginning and Mechanization Chair

PROFESSIONAL LICENSE

Registered Professional Engineer - Registration. No. 32340 - Texas

SELECTED PUBLICATIONS

-Refereed Journal and Peer Reviewed Articles:

7. Lesikar, B. J., C. B. Parnell, Jr. and A. Garcia. 1991. Determination of Grain Dust Explosion Parameters. ASAE Transactions 34:(2) 571-576. (Received Outstanding Paper Award)

-Books:


**SCIENTIFIC AND PROFESSIONAL SOCIETIES**

★ American Society of Agricultural Engineers
★ American Society for Engineering Education
★ Air and Waste Management Association
★ Texas Society of Professional Engineers
★ National Society of Professional Engineers
★ Reserve Officers Association

**HONORS AND AWARDS**

★ The Dean’s Outstanding Achievement Award for Excellence in Teaching; The College of Agriculture and Life Sciences; Dr. Mark Hussey, Vice Chancellor and Dean.
★ Elected “2008 Honor Professor” of the two student organizations AGSM and BAEN.
★ 2002 Served on the National Academy of Sciences Committee on Air Emissions from Animal Feeding Operations.
★ Appointed by the Secretary of Agriculture to the USDA Air Quality Task Force to four 2-year terms 1996-2004.
★ Appointed to Regents Professor, 1997.
★ Received the Vice Chancellor’s Award for Excellence in undergraduate teaching, 1997.
★ Elected to grade of Fellow in ASAE, 1995.
★ College of Engineering Distinguished Teaching Award Sponsored by the Former Students' Association, 1991.
★ Appointed by the Governor of Texas to the Texas Air Control Board, 1989.
★ Army Commendation Medal, 1970.
DANA OSBORNE PORTER
Associate Professor and Extension Agricultural Engineering Specialist – Water Management

EDUCATION:
Ph.D., Agricultural and Biological Engineering, Mississippi State University, 1993
M.S., Agricultural Engineering, Texas A&M University, 1989
B.S., Agricultural Engineering, Texas A&M University, 1987

TEXAS A&M UNIVERSITY EMPLOYMENT:
Associate Professor and Extension Agricultural Engineering Specialist – Water Management, Texas A&M AgriLife Research and Extension Service. Lubbock, TX, 2005-present
Assistant Professor and Extension Agricultural Engineering Specialist – Water Management, Texas A&M AgriLife Research and Texas AgriLife Extension Service. Texas A&M University System, Lubbock, TX, 1998-2005

OTHER PROFESSIONAL EXPERIENCE:
Assistant Professor, New Mexico State University Department of Civil, Agricultural, and Geological Engineering, Las Cruces, NM, 1993-1996
General Engineer- USDA-ARS Crop Simulation Research Unit, Starkville, MS, 1989-1993
Graduate Research Assistant- Texas A&M University Department of Agricultural Engineering, College Station, TX, 1988-1989
Engineering Technician- USDA-ARS Grassland, Soil and Water Research Laboratory, Temple, TX, 1987

PROFESSIONAL REGISTRATION: Licensed Professional Engineer, New Mexico State Board of Licensure for Professional Engineers and Professional Surveyors (NM 12720)

SELECTED RECENT REFEREED PUBLICATIONS:


PROFESSIONAL SOCIETY MEMBERSHIP AND SERVICE:
American Society of Agricultural and Biological Engineers – (partial list of committees)
Board of Trustees: 2012-2015
Soil and Water Division Steering Committee and Program Committee: 2012-2014
Irrigation Group (SW-24): Member since 2010; vice-chair 2011-2012; chair 2012-2014
American Society of Civil Engineers – Environmental and Water Resources Institute:
ASCE-EWRI ET Committee: 2011-present
Texas Agricultural Irrigation Association: Education Advisor 1999-present

Service on review boards, panels (partial list)
USDA-NIFA OSRS Cotton Processing Review Panel: Chair 2015
NIWR-USGS National Competitive Grants Program: 2014
USDA-ARS Research Position Evaluation System. In-Depth Reviewer
USDA-ARS National Program 211 Review Panel: 2011

Selected University committee activities:
Texas A&M University Department of Biological and Agricultural Engineering
- Search Committee for Irrigation Specialist Position at Amarillo. Chair, 2013-present
- Extension Water Programs Recognition and Revenue Generation Committee, 2011-
- Awards and Recognition Committee, 2011-present
Consortium for Irrigation Research and Education. (Texas Water Resources Institute, Texas A&M AgriLife Research and Extension Service) 2007 – present; chair 2011-2012
Texas High Plains Evapotranspiration Network Steering Committee, 2004 – present
Western Association of Agricultural Experiment Station Directors Multi-State Projects:
Meteorology and Climate Data Research Group: Western Regional Project(s): Member 2007-present; compiled NIFA/CRIS reports; secretary 2012; chair 2013

AWARDS, HONORS AND DISTINCTIONS (partial list)
Western Region Excellence in Multistate Research Award. 2014. Awarded to Microirrigation Research Group by Western Association of Agricultural Experiment Station Directors.
Award for Excellence in Extension Education. 2013. Department of Biological and Agricultural Engineering, Texas A&M University.
Save Texas Water Blue Legacy Award in Agriculture, 2012. Awarded to the USDA-ARS Ogallala Aquifer Program team by the Texas Water Development Board.
Engineer of the Year, 2007. Texas Section of the American Society of Agricultural and Biological Engineers.
American Society of Agricultural and Biological Engineers Educational Aids Competition Blue Ribbon Awards: 2005, 2006 (2), 2014
GERALD L. RISKOWSKI
Professor

EDUCATION:
- B.S. Agricultural Engineering University of Nebraska 1974
- M.S. Agricultural Engineering University of Nebraska 1976
- Ph.D. Agricultural Engineering Iowa State University 1986

TAMU FACULTY EMPLOYMENT:
13 years on this faculty; Initial Appointment: January 1, 2002
Professor, 2010-Present, Biol. & Ag. Engr. Dept--TAMU
Professor and Head, 2002-2010, Biol. & Ag. Engr. Dept--TAMU

OTHER PROFESSIONAL EMPLOYMENT:
- Professor 1997-2001  Ag. Engr.--University of Illinois, Urbana, IL
- Assoc. Professor 1992-1997  Ag. Engr.--University of Illinois, Urbana, IL
- Assist. Professor 1986-1992  Ag. Engr.--University of Illinois, Urbana, IL
- Instructor 1980-1986  Iowa State University, Ames, IA
- Design Engineer 1976-1977 Lester’s Buildings, Lester Prairie, MN

CONSULTING, PATENTS, ETC.:
Invited speaker Hefei University of Technology, Hefei, China 2013.
Invited speaker National Taiwan University, Taipei, Taiwan, 2010
Invited speaker at Zhejiang University, Jilin University and China Agricultural University, P.R. of China, 2007.
Design of Bioenvironmental Engineering Laboratory, 2001-2002, Beijing, P.R. China. China Agricultural University.

STATES REGISTERED: Wisconsin and Illinois

PRINCIPAL PUBLICATIONS OF THE LAST FIVE YEARS:
Journal articles from past 5-years:


SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH A MEMBER:
American Society of Agricultural and Biological Engineers (ASABE)
American Society for Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

HONORS AND AWARDS:
Fellow, ASABE, 2007
ASABE Honorable Mention Paper Award, 2006.
3 ASHRAE Technical/Symposium Paper Awards, two in 2001, one in 2002
ASAE Henry Giese Award, 2001
Rural Builders Hall of Fame, 1998
ASAE Outstanding Paper Award, 1994.
8 ASAE Blue Ribbon Awards for publications.
Teaching Academy, College of ACES, University of Illinois, Urbana-Champaign, 1993-1996

INSTITUTIONAL AND PROFESSIONAL SERVICE IN THE LAST FIVE YEARS:
Associate Editor for ASABE
Editorial Advisory Board for the Encyclopedia of Agricultural, Food, and Biological Engineering, 2005-present.
ASABE Committees:
ED-01 Executive/Steering
ED-210 Academic Program Administrators (Chair 2008-2009)
ED-210/1 Steering (Chair 2009-2010)
SE-05 Publications Review
ASHRAE Committee TC 2.2 Plant and Animal Environment
SAC-05 Multi-State Agricultural and Biological Engineering Dept Heads (Chair 2005-2006)

PROFESSIONAL DEVELOPMENT ACTIVITIES IN THE LAST FIVE YEARS:
Attended ASABE International meetings
Attended ASHRAE meetings
Attended Texas Section ASAE meetings
STEPHEN W. SEARCY
Professor and Head

EDUCATION:
   University of Missouri, B.S. Agricultural Mechanization, 1974
   University of Missouri, B.S. Agricultural Engineering, 1976
   University of Missouri, M.S. Agricultural Mechanization, 1976
   Oklahoma State University, Ph.D. Agricultural Engineering, 1980

TAMU FACULTY EMPLOYMENT:
   29 years on this faculty; Initial Appointment in 1980
   2002 - present - Professor and Associate Head, Department of Biological and
   Agricultural Engineering, Texas A&M University.

OTHER PROFESSIONAL EMPLOYMENT:
   1987 – 1988  Senior Research Fellow, 1987-1988, Department of Agricultural
   Engineering, Wageningen Agricultural University, Wageningen, The Netherlands.
   Conducted research on machine vision inspection of flower bulbs

CONSULTING, PATENTS, ETC.:
   Water Shedding Module Builder.  US Provisional Patent.  2008  (full patent under
   preparation)
   Parker Brothers Farm.  Provided engineering analysis on the probable cause of injury on
   a cotton module builder.  2008
   Swift Beef Company.  Provided engineering analysis and expert opinion on the
   proximate cause of failure of shaftless augers in a processing plant.  2007
   OUTY, Inc.  Evaluated crop damage resulting from adverse weather using remote
   sensing imagery.  2005
   Workman Ag. Consultants.  Provided expert opinion on the functionality of precision
   agriculture software.  2002
   Ciba Giegy, Inc.  Provided expert opinion on the operational characteristics of a variable
   rate liquid fertilizer application system.  1992-93.
   Navistar, Inc.  Provided expert opinion on tractor fuel system design.  1990
   Texas Forest Service.  Developed a microprocessor based counter for a pine seedling
   harvester.  1983.

STATES REGISTERED:
   Texas

PRINCIPAL PUBLICATIONS OF THE LAST FIVE YEARS:
   Stabile, M. C. C., and S. W. Searcy.  2009.  Validation of the soil line transformation
   Spatial variation of fiber quality and associated loan rate in a dryland cotton field.
   Transactions of ASABE 51(3): 803-810 .


SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH A MEMBER:
American Society of Agricultural and Biological Engineers
National Society of Professional Engineers
Council for Agricultural Science and Technology

HONORS AND AWARDS:
Fellow, ASABE. Recognition of outstanding service or contribution to the discipline of Agricultural and Biological Engineering.

2007 Blue Ribbon Award in the Educational Aids Competition - Publications: Fact Sheets, Circulars or Bulletins category (one award per year per category)

IET Division Chair Distinguished Service Award, American Society of Agricultural Engineers. 2000. One annual award given for service to the Information and Electric Technologies Division.

1998 Blue Ribbon Award in the Educational Aids Competition - Publications: Fact Sheets, Circulars or Bulletins category (one award per year per category)

1994 Blue Ribbon Award in the Educational Aids Competition - Publications: Fact Sheets, Circulars or Bulletins category (one award per year per category)

1992 American Society of Agricultural Engineers Paper Award. Awarded to top 2.5% of papers published by ASAE.

1989 American Society of Agricultural Engineers Paper Award. Awarded to top 2.5% of papers published by ASAE.

1987 Arch T. Colwell Merit Award from the Society of Automotive Engineers. Awarded to outstanding papers presented at SAE meetings. (19 awards selected from over 1500 papers)

INSTITUTIONAL AND PROFESSIONAL SERVICE IN THE LAST FIVE YEARS:
ASAE Committees:  E-20 Finance Committee, 2002-09;  E-8 Fellows Committee, 2008-09;  P-122 Boyd-Scott Graduate Research Award Committee, 2008-09
Texas A&M University:  Spatial Science Laboratory Advisory Committee, 2004
Various funding agencies:  frequent ad hoc reviewer of research proposals
Various universities: frequent evaluator of promotion and tenure packets

**PROFESSIONAL DEVELOPMENT ACTIVITIES IN THE LAST FIVE YEARS:**
Center for Teaching Excellence: participate in 1-3 workshops per year
Zhuping Sheng

Department of Biological and Agricultural Engineering, Texas A&M University
Texas A&M AgriLife Research Center at El Paso
1380 A&M Circle, El Paso, TX 79927, USA
Phone: (915) 859-9111 ext. 233; Fax: (915) 859-1078
E-mail: zsheng@ag.tamu.edu
http://elpaso.tamu.edu/sheng

I. EDUCATION
Ph. D. Hydrology/Hydrogeology, Minor in Geological Engineering, 1996, University of Nevada, Reno, Nevada, USA
M. Sci. Engineering Geology/Hydrogeology, 1987, Institute of Geology, Chinese Academy of Sciences, Beijing, China
B. Eng. Hydrogeology/Engineering Geology, 1983, Tongji University, Shanghai, China

AgriLife Advanced Leadership Cohort III, Texas A&M University, 2014-16.

II. EMPLOYMENT HISTORY
Professor, Department of Biological and Agricultural Engineering (BAEN), Texas A&M University, Texas A&M AgriLife Research Center at El Paso, TX, 2014 – present,
Associate Professor, 2007 – 2014, Assistant Professor, 2001 – 2007
Adjunct Professor, Texas Tech University, Lubbock, Texas, 2009 - present
Adjunct Professor & Graduate Faculty (2013-2018), Department of Civil Engineering, New Mexico State University, Las Cruces, New Mexico, 2004 - present
Adjunct Professor, Institute Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China, 2007-2009

Hydrogeologist, El Paso Water Utilities, El Paso, TX, 1998 - 2001
Postdoctoral Fellow /Visiting Assistant Professor, Department of Civil Engineering, Morgan State University, Baltimore, Maryland, 1997 – 1998
Assistant Professor, Institute of Geology, Chinese Academy of Sciences, Beijing, China, 1989 – 1991
Research Assistant, Institute of Geology, Chinese Academy of Sciences, Beijing, China, 1983 - 1988

III. PROJECTS AND FUNDING
Sustainable Water Resources for Irrigated Agriculture in a Desert River Basin Facing Climate Change and Competing Demands: From Characterization to Solutions, USDA-NIFA, Co-PI, Team with UTEP.
Implementing the Pecos River watershed protection plan thru hydrogeological assessment & airborne electromagnetic survey, EPA 319 Program, TSSWCB, PI.
A Hydro-Econometric analysis of producer water use and aquifer hydrology in the Texas High Plains, U.S. Department of Agriculture -CSREES, PI; Team with Texas Tech University
Development of RiverWare model of the Rio Grande for water resources management in the Paso Del Norte watershed, U.S. Army Corps of Engineers, PI
Assessment of snowmelt and runoffs in an inland river in an arid region in response to climate changes, National Science Foundation of China, Ministry of Human Resources and Social Security, Xinjiang Water Resources Bureau, Co-PI.

Crop water conservation system in arid regions, 948 Projects, Ministry of Water Resources, China, Technical advisor.

Economic assessment of Rio Grande salinity, U.S. Army Corps of Engineers, Co-PI

Evaluation of irrigation efficiency strategies for Far West Texas: Feasibility, water savings and cost considerations, Texas Water Development Board, Co-PI

Groundwater and surface water interaction and conjunctive uses in the Qiadam Basin – case study at the Xiangride-Qiadam River, Institute Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, Co-PI.

Membrane treatment of impaired irrigation return and other flows for creating new sources of high quality water, AWWARF, U.S. Bureau of Reclamation & El Paso Water Utilities, Co-PI

Installation of river and drain instrumentation stations to monitor flow and water quality and internet data sharing, sponsored by USBR, EPWU and TAES: PI.

Evaluation of alternatives for improvement of water delivery efficiency, hydrological modeling of the Rio Grande basin (Soil and Water Assessment Tool), and decision support system for irrigation district management (Rio Grande Basin Initiative on Irrigation Efficiency, USDA): Co-PI.


Integrated management strategies to protect and conjunctively use water resources in the Paso Del Norte Region (USDA Hatch Project): PI.


Saltcedar control and water uses studies and monitoring; watershed protection plan development for the Pecos River, PI, C. Hart, sponsored by USEPA and Texas State Soil and Water Conservation Board; Co-PI.

The use of reclaimed effluents and salty groundwater as irrigation sources for cotton culture and vegetable production; the Texas Cotton Incorporated and USBR; PI.

Regional water resources plan for the Far West Texas (Senate Bill 2, TWDB): Co-PI.

Water conservation through reuse of gray water (USBR): Co-PI.

Seepage losses and water salvage by canal lining (TWRI, USBR and El Paso County Water Improvement District No. 1): PI

**IV. SELECTED PUBLICATIONS**


Gutchick, V.P., and Z. Sheng. 2013. Control of atmospheric fluxes from a pecan orchard by physiology, meteorology, and canopy structure: modeling and measurement. Agricultural Water Management. 129: 200-211, DOI: 10.1016/j.agwat.2013.08.004


**V. HONORS AND AWARDS**


Vice Chancellor’s Award in Excellence Research Team for the Rio Grande Basin Initiative, TAMU Agriculture Program, 2006.

**VI. PROFESSIONAL ACTIVITIES AND LICENSES**
Invited Committee Member, Advisory Committee on Sustainable Underground Storage of Recoverable Water, National Academy of Sciences, National Research Council, Water Science and Technology Board; 2005-06.


Past President, President (2012-13), President-Elect (2011-12), Association of Oversea Chinese Agricultural, Biological and Food Engineers.

American Society of Civil Engineers (ASCE), Environmental and Water Resources Institute
Past Chair, Chair (2011-2013) and Vice Chair (2009-2011), Committee of Groundwater Hydrology.
Chair (2008–2009) and Vice Chair (2006–2008), Committee of Groundwater Management – Program
Secretary, Land Subsidence Task Committee, 2002-present.
Award Committee Member, the Groundwater Council, 2008–2010.
Co-Chair (2014-present), Chair (2011-2013), AWRA International Affairs Committee.
Chair of Technical Committee on Aquifer Storage and Recovery (ASR); American Water Resources Association (AWRA); 2002-03
Board Member, 2012-2014, Chinese American Water Resources Association (CAWRA);

Vice Chair, 2011-2012, Basin and Bay Expert Science Team (BBEST) for upper Rio Grande, TCEQ.

Technical Committee Co-Chair, Executive Member, 2002-present, Paso del Norte Watershed Council.

Outstanding Research Fellow, 2010-present, Ministry of Human Resources and Social Security and Oversea Chinese Scholars Committee of Xinjiang Bureau of Human Resources and Social Security, Urumqi, China.

Outstanding Research Fellow, 2007-2013, Collaborative research on hydrologic cycle in arid region; sponsored by Institute of Geographical Sciences and Natural Resource Research, Chinese Academy of Sciences and Institute of Water Resources and Hydropower, Qinghai Province.


Expert Testimony: Hydrologic impacts review in support of protest of the New Mexico Office of State Engineering water rights application No. 4830: The City of Albuquerque proposal to divert surface water from the Rio Grande; William J. Miller Engineers and Peter Thomas White, Attorney; Santa Fe, New Mexico, 2002.

Associate Editor, Journal of Hydrologic Engineering, ASCE, 2009–present.
Associate Editor, Transactions of ASABE & Journal of Application of Engineering in Agriculture, 2010–present.
Section Editor, International Journal of Agricultural and Biological Engineering, 2012-present
Professional Engineer License in Texas (87496) since 2001.
VIJAY P. SINGH
Distinguished Professor & Lehrer Distinguished Chair in Water Engineering

EDUCATION:
D.Sc., Environmental Engineering, University of the Witwatersrand, South Africa, 1998
Ph.D., Civil Engineering, Colorado State University, 1974
M.S., Engineering (Hydrology), University of Guelph, Guelph (Canada), 1970
B.S., Agric. Engineering, G.B. Pant University, Pantnagar (India), 1967

TEXAS A&M UNIVERSITY EMPLOYMENT:
Caroline and William N. Lehrer Distinguished Chair in Water Engineering, and Distinguished Professor, Department of Biological and Agricultural Engineering, and Zachry Department of Civil Engineering (from July 1, 2006-present)

OTHER PROFESSIONAL EMPLOYMENT:
Arthur K. Barton Endowed Professor (from January 1999-June 2006), Professor of Civil and Environmental Engineering & Coordinator of Water Resources Program (from August 1983 to present), Louisiana State University
Associate Professor of Civil Engineering (July 1981-August, 1983), Louisiana State University
Acting Director (May 1984 - July 1986), Louisiana Water Resources Research Institute, Louisiana State University
Associate Professor of Civil Engineering (8/78 - 7/81), Mississippi State University,
Associate Research Professor of Civil Engineering (7/77-7/78), The George Washington University
Assistant Professor of Hydrology (8/74 - 6/77), New Mexico Institute of Mining & Technology
Postdoctoral Research Fellow (6/74 - 7/74), Colorado State University
Engineer and Member of the Technical Staff (9/67 - 9/68), The Rockefeller Foundation, New Delhi office, India

REGISTRATION:
Registered Professional Engineer, State of Louisiana; Professional Hydrologist; Hon. Diplomate, American Academy of Water resources Engineers

PRINCIPAL PUBLICATIONS:


SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:
Academician, Georgia Fazisi Academy, Republic of Georgia, 1997; Member, Russian Academy of Water Management, 2002; Fellow, Georgian Academy of Sciences, Republic of Georgia, 2002; Member (Foreign), Mexican Academy of Engineering, Mexico, 2003; Member (Foreign), Mexican Academy of Sciences, Mexico, 2003; Member (Foreign), Engineering Academy of the Czech Republic, 2004; Member (Foreign), Polish Academy of Sciences, 2005; Member, Russian Academy of Ecological Sciences, 2006; Member, Portuguese Academy of Engineering, 2007; Fellow (Foreign), National Academy of Agricultural Sciences (India), 2008; Fellow, American Society of Civil Engineers, 1994-present; Fellow, Environmental and Water Resources Institute, 2013-present; Fellow, American Water Resources Association, 1986-present; Member (Life), American Geophysical Union, 1972-present; Member, International Association for Hydraulic Research, 1980-present; Member, International Association of Hydrological Sciences, 1974-present; Member (Life), U.S. Committee of the International Commission on Irrigation and Drainage, 1985-present; Member, World Association for Sedimentation and Erosion Research, 2005-present.

HONORS AND AWARDS:
Arid Lands Hydraulic Engineering Award, given by American Society of Civil Engineers, 2002; Distinguished Research Master Award, given by Louisiana State University, 2003; Ven Te Chow Award, given by American Society of Civil Engineers, 2005; Ray K. Linsley Award, given by American Institute of Hydrology, Atlanta, 2006; Honorary Ph.D. in Environmental and Territorial Engineering, given by the University of Basilicata, Italy, 2006; Honorary Diplomate, American Academy of Water Resources Engineers, 2008;
Gold Medal, given by Korean Society of Civil Engineers, 2009; Founder’s Award, American Institute of Hydrology, 2009; Richard R. Torrens Award, American Society of Civil Engineers, 2009; Norman Medal, American Society of Civil Engineers, 2010; Honorary Doctorate in Engineering, given by the University of Waterloo, Canada, 2010; Texas A&M University Bush Excellence Award for Faculty in International Research, 2012; Hydrology Days Lecture Award- Colorado State University and AGU, 2013; University Distinguished Professor Award, 2013, Texas A&M University, College Station; Lifetime Achievement Award, Environmental and Water Resources Institute, American Society of Civil Engineers, 2013; Honorary Doctor of Science (D.Sc.), given by the University of Guelph, Canada, 2014.

INSTITUTIONAL AND PROFESSIONAL SERVICE (last 5 years):
PATRICIA K. SMITH
Associate Professor

EDUCATION:
B.S.  Business Management  Oklahoma State Univ.  1992
M.S.  Biosystems and Agricultural Engineering  Oklahoma State Univ.  1996
Ph.D.  Biological and Agricultural Engineering  North Carolina State Univ.  2000

TAMU FACULTY EMPLOYMENT:
15.0 years on this faculty; Initial Appointment:  May 1, 2000
Associate Professor, 2006-present, Biological & Agricultural Engineering Dept.--TAMU
Assistant Professor, 2000-2006, Biological & Agricultural Engineering Dept.--TAMU

OTHER PROFESSIONAL EMPLOYMENT:

PRINCIPAL PUBLICATIONS OF THE LAST FIVE YEARS:

SCIENTIFIC AND PROFESSIONAL SOCIETIES OF WHICH A MEMBER:
American Society of Agricultural and Biological Engineers
American Society of Engineering Education

HONORS AND AWARDS:
2013 Association of Former Students University Level Distinguished Achievement Award in Teaching
2012-2015 Cintron University Professor for Undergraduate Teaching Excellence
151 Association of Former Students College Level Distinguished Achievement Award in Teaching for the College of Agricultural and Life Sciences.

2011 American Society of Agricultural and Biological Engineering Superior Paper Award

2009/2010 BP Teaching Excellence Award, Dwight Look College of Engineering

2009 Biological and Agricultural Engineering Department Award for Excellence in Teaching

INSTITUTIONAL AND PROFESSIONAL SERVICE IN THE LAST FIVE YEARS:

ASABE Committees: SW-03 Standards (Vice-Chair 2011-2012, Member, 2009-Present), SW-21 Hydrology

BAEN Departmental: Undergraduate Curricula Committee, Space Committee, Scholarship Committee (Chair), ABET (Chair), Growth Committee (Chair), Instructional Enhancement Committee, FAC, Graduate Program Committee, International Programs Committee, Communications Committee (2008-2011), Differential Tuition Advisory Committee, ASABE Student Club (Secondary Advisor 2013-2014), ASABE Student Club (Advisor 2014-2015), BAEN GSA (Secondary Advisor 2014-2015)

Water Management and Hydrologic Science Interdisciplinary Program: Executive Committee, Admissions Committee

Texas A&M, College of Engineering: COE 25 for 25 (Growth Committee), COE UGA, COE Honors Program, COE Entry to a Major, COE COOP Coordinator.

Texas A&M University: Undergraduate Academic Appeals Committee, CTE Faculty and Student Advisory Committee, AFS Distinguished Achievement Awards Selection Committee, Brown-Rudder and Gates Muller Outstanding Student Awards Selection Committee

State of Texas: Texas Higher Education Coordinating Board Committee to set standards for Agriculture Courses across State 2 and 4 year colleges.

PROFESSIONAL DEVELOPMENT ACTIVITIES IN THE LAST FIVE YEARS:

Attended ASABE International meetings

TAMU, CTE Faculty Teaching Academy

TAMU, CTE Using Technology in the Classroom Seminar

TAMU, Assessment Conference

TAMU, CIS eCampus Workshop
Raghavan Srinivasan

Texas A&M University and Texas A&M AgriLIFE Research
Professor Ecosystem Science and Management and Blackland Research and Extension Center
Director of Spatial Sciences Laboratory
Research Plaza, Suite B223, College Station, TX 77845
TEL: (979) 845-5069
Email: r-srinivasan@tamu.edu

Previous Education, Experience, and Awards

1. Educational Training
   2. M.S. Agricultural Engineering, Asian Institute of Technology (Bangkok), 1989.

2. Work Experience
   1. September 2011 – present: Senior Scientist of Borlaug Institute
   2. September 2004 - present: Professor, TAMU and Texas AgriLife Research (TALR).
   3. August 2000-present: Director of Spatial Sciences Laboratory, Texas A&M University (TAMU), TX.
   4. September 1999- August 2004: Associate Professor, TAMU and Texas Agricultural Experiment Station (TAES).
   5. April 1999- July 2000: Assistant Director of Mapping Science Laboratory, TAMU, College Station, TX.
   6. 1998-present: Adjunct Professor, School of Rural Public Health, Health Science Center, TAMU.
   7. 1996-1999: Assistant Professor, TAES, Temple, TX.
   9. 1989-1992: Graduate Research Assistant, Purdue University, W. Lafayette, IN.

3. Honors and Awards
   • 2013: Awarded Docteur Honoria Causa (Honorary Doctorate Award) by Paul Sabatier University – Toulouse III in 2013 in recognition of outstanding scientific accomplishments.
   • 2012: 2011 Norman Hudson Memorial Award from the World Association of Soil and Water Conservation for outstanding contribution to soil and water conservation and the successful develop and worldwide application of the Soil and Water Assessment Tool (SWAT) model, received on July 18, 2012, during the International SWAT conference at IIT, Delhi, India.
2011: Honorary appointment as Senior Scientist of Borlaug Institute for a five year period from 2011

2010: Awarded 2010 Scientist of the year by the Biological and Agricultural Engineering Department, Texas A&M University.


Vice Chancellor’s Award in Excellence in recognition of outstanding contributions and performance as a member of a research team for 2001 (Soil and Water Assessment Tool Team).

Awarded Scientist of the Year at Blackland Research Center, 1998.


Selected for the 1994 summer program in Global Climate Change by Jet Propulsion Lab, California Institute of Technology, CA, 1994.

Recipient of the Ismail Interdisciplinary Program Doctoral Research Award, Purdue University, 1991.


4. Society Memberships
1. American Society of Agricultural and Biological Engineers (ASABE).
John M. Sweeten Jr., Ph.D., P.E.
Resident Director and Professor of Agricultural Engineering

Texas AgriLife Research—Amarillo and Vernon
Texas AgriLife Research and Extension Center at Amarillo
6500 Amarillo Blvd. West, Amarillo, Texas 79106-1796
806/677-5600; 806/677-5644 (Fax); E-mail: j-sweeten@tamu.edu

Degree Field Institution Date
B. S. Agricultural Engineering Texas Tech 1965
M. S. Agricultural Engineering Oklahoma State University 1967
Ph. D. Agricultural Engineering Oklahoma State University 1969

SERVICE ON FACULTY OF TEXAS A&M UNIVERSITY SYSTEM: Years of Service: 41
1996-present Professor and Resident Director, Texas AgriLife Research. Texas AgriLife Research and Extension Center- Amarillo, TX; and Professor, West Texas A&M University, Division of Agriculture, Canyon, TX
2008-present Professor and Resident Director, Texas AgriLife Research. Texas AgriLife Research and Extension Center- Vernon TX
1990-95 Professor, Associate Department Head and Program Leader for Extension Agricultural Engineering, Department of Agricultural Engineering, Texas Cooperative Extension (TCE), Texas A&M University System, TAMUS.
1989-90 Interim Program Leader and Extension Agricultural Engineer -- Waste Management, Department of Agricultural Engineering and TCE
1984-91 Professor & Extension Agricultural Engineer, TCE & Agricultural Engineering Department, TAMUS.
1981-84 Associate Professor, Agricultural Engineering Department
1972-89 Agricultural Engineer/Waste Management, TCE, TAMUS.

PROFESSIONAL REGISTRATION: Texas Board of Professional Engineers (PE), License No. 33690 in Texas

MEMBERSHIPS:
American Society of Biological and Agricultural Engineers/ASABE (47 years); Fellow, 1990
Council for Agricultural Science and Technology
Research Centers Administrators Society
Texas Farm Bureau
Texas Sheep & Goat Raisers Association

HONORS AND AWARDS:
Vice Chancellor’s Award in Excellence, Texas A&M University System Agriculture Program (Industry/Agency/University/Association Team), 2003
Distinguished Achievement Award, (National) Epsilon Sigma Phi, Water Quality Education, 1996
USDA Award for Superior Service (Co-Winner, Extension Water Quality Initiative Team), 1995
Environmental Excellence Award, U. S. Environmental Protection Agency (USEPA) Region VI, 1994
Environmental Excellence Award, Texas Cattle Feeders Association, 1990
Fellow, American Society of Agricultural Engineers (ASAE), 1990
G. B. Gunlogson Countryside Engineering Award, ASAE, 1989

INDUSTRY/GOVERNMENTAL/EXTERNAL COMMITTEES:
Project Director, USDA-CSREES Special Research Grant, Air Quality: Reducing Emissions from Cattle Feedlots & Dairies (TX & KS), 2002-2010
USDA Agricultural Air Quality Task Force, 1997-2004
Panhandle Regional Water Planning Group, Member, 1999-2009
Harrington Regional Medical Center, Board of Directors, 1999-2009
  • Administrators Council, 1996-2009; Chairman, 2003 – 2004
  • Executive Committee, 2003 - 2004
National Center for Manure & Animal Waste Management (14-States USDA-CSREES), Operations Committee-2000-2003
National Pork Producers Council
  • Agricultural Technology Evaluation Program, 2000
  • Odor Subcommittee/Research Committee, 1994-96
Texas Natural Resource Conservation Commission, Agricultural Advisory Committee, 1992-98
National Cattlemen’s Beef Association, Environmental Stewardship Award Committee, 1991-98

PATENT ACTIVITY
Annamalai, K., J.M. Sweeten and M. Freeman. 2009. A Reburn Injection System and Optimization with Animal Waste Based Biomass Fuels (ANB) for NOx and Hg Reduction in Power Plants. Submitted to TAMUS Office of Technology Commercialization (OTC), Texas A&M University System, College Station, TX.

INVITED PRESENTATION, INTERNATIONAL
PRINCIPAL RECENT PUBLICATIONS, Last 5 Years (career total= 655):


**J. ALEX THOMASSON**  
*Professor*  
Department of Biological & Agricultural Engineering  
Texas A&M University  

**EDUCATION:**  
Ph.D., Agricultural Engineering, University of Kentucky, 1997  
M.S., Agricultural Engineering, Louisiana State University, 1989  
B.S., Agricultural Engineering, Texas Tech University, 1987  

**EMPLOYMENT:**  
Professor, Biological and Agricultural Engineering, Texas A&M University, 2005 to present.  
Associate Professor (1999 to 2004), Assistant Professor (1997 to 1999), Agricultural and Biological Engineering, Mississippi State University  

**CREDENTIALS:**  
Professional Engineer, State of Mississippi, No. 17104  

**REFEREED PUBLICATIONS (last 5 years):**  


RECENT TEACHING ACTIVITIES AT TEXAS A&M UNIVERSITY:
BAEN 375 Design Fundamentals of Agricultural Machines and Structures (3 hours, 46 undergraduate students)
BAEN 689 Optoelectronic Sensor Design for Agricultural and Biological Applications (4 hours, 5 graduate students)
BAEN 370 Measurement & Controls in Agricultural & Food Processing (3 hours, 48 students)

SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP:
American Society of Agricultural and Biological Engineers (ASABE)
International Society of Precision Agriculture (ISPA)

HONORS AND AWARDS:
2012 Award for Excellence in Research, Department of Biological & Agricultural Engineering, Texas A&M University.
2009 Superior Paper Award, American Society of Agricultural and Biological Engineers, for the article, “Multispectral Sensor for In-Situ Cotton Fiber Quality Measurement,” published in Transactions of the ASABE.
2003 Research Paper Impact Award, Mississippi State University Division of Agriculture, monetary award and plaque, for scientific publication with the greatest impact on Mississippi agriculture: “Mississippi Cotton Yield Monitor: Three Years of Field Test Results,” published in Transactions of the ASAE.
2002 Researcher of the Year Award, Mississippi State University Division of Agriculture.
Ruixiu Sui

EDUCATION
Ph.D.  Biosystems Engineering, 1999, University of Tennessee at Knoxville
MS  Agricultural Engineering, 1987, University of Tennessee at Knoxville
BS Radio-physics, 1979, Lanzhou University, Lanzhou, China.

WORK EXPERIENCE
Oct 09 --  Research Agricultural Engineer; Lead Scientist  USDA-ARS
Sep 14 --  Adjunct Professor  Texas A&M University
Oct 09/Aug 14  Adjunct Associate Professor  Texas A&M University
Mar 07/Sep 09  Research Associate Professor  Texas A&M University
Jul 05/Feb 07  Associate Research Engineer  Texas A&M University
Apr 01/Jun 05  Assistant Research Professor  Mississippi State University
Jun 99/Mar 01  Postdoctoral Research Assistant  Mississippi State University
Jan 96/May 99  Graduate Research Assistant  University of Tennessee at Knoxville
Aug 91/Nov 95  Department Head  Chinese Academy of Agricultural Sciences
Jan 88/Dec 95  Research Associate/Associate Professor  Chinese Academy of Agricultural Sciences
Mar 86/Dec 87  Visiting Scholar/Grad. Res. Assistant  University of Tennessee at Knoxville
Sept 79/Feb 86  Research Assistant  Chinese Academy of Agricultural Sciences

PATENTS
High Accuracy Auto-Ranging Photometer  
Optical-Reflectance-Based Mass-Flow Sensor  
J. Alex Thomasson and Ruixiu Sui. 2004. US Patent No.: 6,809,821
Multispectral Natural-Fiber-Quality Sensor for Real-Time In-Situ Measurement  

AWARDS
2009 ASABE Superior Paper Award; awarded by American Society of Agricultural and Biological Engineers.
Research Paper Impact Award for scientific publication with the greatest impact on Mississippi agriculture ($500 personal award and plaque); awarded by MAFES. 2003.
Scientific Research Achievement Award, Ministry of Agriculture of China, 1983.

PROFESSIONAL INVOLVEMENT
Member, American Society of Agricultural and Biological Engineers (ASABE)
Member of Gamma Sigma Delta, Honor Society of Agriculture, USA. Inducted in 1987

PROFESSIONAL SERVICE (last 5 years)
Division Editor (2012-), Associate Editor (2009-2011), International Journal of Agricultural and Biological Engineering (IJABE)
Chair (2014-), Vice Chair (2013-2014), ASABE IET Standards Committee
Chair (2010-2011), Vice Chair (2010), Secretary (2009), ASABE Machine Vision Committee/IET-312
Vice President (2009-2010), Board member (2007-2009), Association of Overseas Chinese Agricultural, Biological and Food Engineers
Member, ASABE Irrigation Management Committee/SW-244
Member, ASABE Cotton Engineering Committee/PM-23/7/3
Member, ASABE Precision Agriculture Committee/PM-54

PUBLICATIONS (selected from last 5 years out of 52)


MOHAN RAO
Adjunct Professor

EDUCATION

Ph.D. N. C. State University, Raleigh, N.C.

M.S. N. C. State University, Raleigh, N.C.
   Major: Bio Engineering Minor: Mathematics

B.Tech.(Hons) Indian Institute of Technology, India

TEXAS A&M EMPLOYMENT

Adjunct Professor, Biological & Agricultural Engineering, Texas A&M University, 1996-

OTHER PROFESSIONAL EMPLOYMENT

Senior Director, Frito-Lay R&D, PepsiCo Inc., Plano, TX, Feb. 2010 to Present

Research Fellow, Frito-Lay R & D, PepsiCo Inc., Plano, TX, Aug. 2006 to Feb. 2010


Principal Research Engineer, R & D, KFC-PepsiCo, Louisville, KY, Feb 1989-1995

Professor, Department of Food Science and Technology, Univ. of Georgia, Athens, GA, July 1984 - 1989

Asst/Assoc. Prof., Department of Food Science & Technology, Univ.of Georgia, Athens, GA, Feb 1975 - 1984

PRINCIPAL PUBLICATIONS & PATENTS (Selected from 85+)

Rao, V.N.M. 2013 Method for making a coated food product having a heat susceptible coating US Patent 8,394,437
Rao, V.N.M. 2012 Fruit and vegetable snacks, US Patent 8,192,784
“Leveraging Food Technology for Obesity Prevention and Reduction Efforts”. The National Academies Press. Washington, DC:

SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIP
Fellow, Institute of Food Technologists
Fellow, International Academy of Food Science & Technology

HONORS & AWARDS
Outstanding Volunteer Award, Food Engineering Division, IFT, 2014
Elected Senior Fellow, PepsiCo Global R&D, 2012
Service Award as Editor-in-Chief, J Texture Studies, John Wiley & Sons, 2011

INSTITUTIONAL AND PROFESSIONAL SERVICE (last 5 years)
Graduate Committee, M Engr. Candidate, Biological & Ag. Engineering, 2013
Higher Education Committee, IFT, 2010-2013
Grant Award Panel, USDA, 2013
Appendix B

List of graduate Courses

BIOLOGICAL & AGRICULTURAL ENGINEERING DEPARTMENT

Department of Biological & Agricultural Engineering
List of Current Graduate Courses

- BAEN 601 Advanced Agricultural Systems Analysis
- BAEN 614 Renewable Energy Conversions
- BAEN 617 Fundamentals of Nanoscale Biological Engineering
- BAEN 620 Food Rheology
- BAEN 622 Unit Operations in Food Processing
- BAEN 625 Advances in Food Process Engineering
- BAEN 627 Engineering Aspects of Packaging
- BAEN 631 Bioprocesses and Separations in Biotechnology
- BAEN 651 Geographic Information System for Resources Management
- BAEN 652 Advanced Topics in Geographic Information System
- BAEN 653 Bioreactor Design
- BAEN 661 Experimental Methods in Biological and Agricultural Engineering
- BAEN 662 Statistical Methods in Biological and Agricultural Engineering
- BAEN 665 Design of Biological Waste Treatment Systems
- BAEN 667 Entropy Theory and its Applications in Water and Environmental Engineering
- BAEN 669 Water Quality Engineering
- BAEN 670 Air Pollution Engineering
- BAEN 672 Small Watershed Hydrology
- BAEN 673 Modeling Small Watersheds
- BAEN 674 Vadose Zone Hydrology
- BAEN 675 Hydrology Across Scale
- BAEN 681 Seminar
- BAEN 683 Per-Review Process and Publication
- BAEN 684 Professional Internship
- BAEN 685 Directed Studies
- BAEN 689 Special Topics in …
- BAEN 690 Theory of Research
- BAEN 691 Research
### BAEN 601 Advanced Agricultural System Analysis

<table>
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<tr>
<th>Catalog Data</th>
<th>BAEN 601 Advanced Agricultural System Analysis, Credit 3</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>AGSM 301 or approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>Application of operations research tools and techniques to the analysis and management of technical systems in agriculture; optimization techniques applied to materials handling, supply chain logistics and other food and agricultural applications.</td>
</tr>
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</table>

### BAEN 614 Renewable Energy Conversions

<table>
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<th>Catalog Data</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>BAEN 320, BAEN 366 or equivalent; or approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>Managing energy/power systems through engineering and technical aspects of quantifying and designing the suitability of several types of renewable energy resources; providing new insights of vast resources that future engineers can harness to augment diminishing supplies of non-renewable energy.</td>
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</table>

### BAEN 617 Fundamentals of Nanoscale Biological Engineering

<table>
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<th>Catalog Data</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate classification in engineering</td>
</tr>
<tr>
<td>Course Description</td>
<td>The course will primarily cover nanostructures, nanofabrication methods, instrumentation and applications pertinent to Biological, Food and Bioenergy systems and will provide students an opportunity to identify and utilize key tools available for fabricating, manipulating and analysis of nanostructures used in Biological Engineering applications.</td>
</tr>
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</table>

### BAEN 620 Food Rheology

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>FSTC 315; PHYS 201; graduate classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Principles of elasticity, viscous flow and visco-elasticity applied to solid and liquid food materials; experimental determination of rheological properties using fundamental methods and empirical textural measurements; applications to food engineering research, textural measurement and quality control.</td>
</tr>
</tbody>
</table>
### BAEN 622 Unit Operations in Food Processing

<table>
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<th>Catalog Data</th>
<th>BAEN 622 Unit Operations in Food Processing, Credit 3</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>Fluid Mechanics, Thermodynamics, Fluid Dynamics</td>
</tr>
<tr>
<td>Course Description</td>
<td>Design of food process engineering systems; basic concepts of rheology and physical properties of foods; fundamentals of heat and mass transfer and process control</td>
</tr>
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### BAEN 625 Advances in Food Engineering

<table>
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<tr>
<td>Prerequisites</td>
<td>Graduate Classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Application of engineering fundamentals to the design of novel/advanced food processing systems including food irradiation, advances in thermal process, food freezing, food dehydration.</td>
</tr>
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</table>

### BAEN 627 Engineering Aspects of Packaging

<table>
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<th>Catalog Data</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Introduction to properties and engineering aspects of materials for use as components of a package and/or packaging system; principles of design and development of packages; evaluation of product-package-environment interaction mechanisms; testing methods; environmental concerns; regulations.</td>
</tr>
</tbody>
</table>
### BAEN 631 Bioprocesses and Separations in Biotechnology

<table>
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<tr>
<th>Catalog Data</th>
<th>BAEN 631 Bioprocesses and Separations in Biotechnology, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Senior classification in engineering, G7, G8 or approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>Application of engineering principles to recovery and purification of biological compounds derived from cell grown in bioreactors, transgenic animals, and plants. Process development, design, and scale up of downstream processes used in biotechnology and pharmaceutical industry. Emphasis on extraction, sedimentation, membrane filtration, precipitation, and liquid chromatography</td>
</tr>
</tbody>
</table>

### BAEN 651 Geographic Information Systems for Resource Managers

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 651 Geographic Information Systems for Resource Managers, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate classification, Cross-listed with ESSM 651</td>
</tr>
<tr>
<td>Course Description</td>
<td>Geographic Information System (GIS) approach to the integration of spatial and attribute data to study the capture, analysis, manipulation and portrayal of natural resource data; examination of data types/formats, as well as the integration of GIS with remote sensing and Global Positioning System; laboratory includes extensive use of GIS applications to conduct analyses of topics in natural resources.</td>
</tr>
</tbody>
</table>

### BAEN 652 Advanced Topics in Geographic Information Systems

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 652 Advanced Topics in Geographic Information Systems, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>BAEN 651</td>
</tr>
<tr>
<td>Course Description</td>
<td>Advanced GIS topics with a focus on modeling actual GIS applications including relational and database theory, design and implementation and its connection to GIS; surface analysis with digital terrain models; and an introduction to spatial statistics.</td>
</tr>
</tbody>
</table>
### BAEN 653 Bioreactor Design

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 653 Bioreactor Design, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>CHEN 651 or approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>Kinetics of enzyme reactions and cell growth applied to bioreactor design, media formulation, cell culture conditions, oxygen transfer and sterilization.</td>
</tr>
</tbody>
</table>

### BAEN 661 Experimental Methods in Biological and Agricultural Engineering

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 661 Experimental Methods in Biological and Agricultural Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>STAT 601 or STAT 651 and STAT 652 or equivalent with approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>Planning and carrying out empirical research with appropriate application of statistical methods for experimental design and analysis; experimental design, data analysis, hypothesis testing, and experimental errors.</td>
</tr>
</tbody>
</table>

### BAEN 662 Statistical Methods in Biological and Agricultural Engineering

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 662 Statistical Methods in Biological and Agricultural Engineering,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate Classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Statistical methods applied to problems in biological and agricultural engineering; parameter estimation; probability distribution fitting; time-series analysis; random variable generation; uncertainty analysis.</td>
</tr>
</tbody>
</table>
**BAEN 665 Design of Biological Waste Treatment Systems**

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 665 Design of Biological Waste Treatment Systems, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate Classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Management and treatment of high organic content waste streams, with emphasis on agricultural; municipal, and agro-industry wastewater; engineering design of biological waste treatment processes: resource recovery from waste streams: recycle and reuse of finished efluent.</td>
</tr>
</tbody>
</table>

**BAEN 667 Entropy Theory and its Application in Water and Environmental Engineering**

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 667 Entropy Theory and its Application in Water and Environmental Engineering, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate classification; knowledge of calculus and statistics at the undergraduate level and approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>Entropy theory, probability distributions, parameter estimation, hydrologic design, rainfall-runoff, infiltration and soil moisture, frequency analyses, sediment yield, velocity distributions, flow forecasting, hydraulic geometry, geomorphic structure, water distribution reliability and water availability assessment.</td>
</tr>
</tbody>
</table>

**BAEN 669 Water Quality Engineering**

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 669 Water Quality Engineering, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>AGEN 350 or equivalent; SCSC 301; ENGR 214; graduate classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Nonpoint source pollution processes including transport mechanisms and contaminant fate; design of best management practices for abating nonpoint source pollution.</td>
</tr>
</tbody>
</table>
### BAEN 670 Air Pollution Engineering

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 670 Air Pollution Engineering, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>AGEN 477 or MEEN 477; MEEN 328 and MEEN 344; or approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>Current topics in air pollution engineering including design and operation of air pollution abatement systems (cyclone, bag filters and scrubbers), emission factors, dispersion modeling, permitting, odor sensing and control, EPA/State Air Pollution Regulatory Agency (SAPRA), TSP, PM10, and PM2.5.</td>
</tr>
</tbody>
</table>

### BAEN 672 Small Watershed Hydrology

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 672 Small Watershed Hydrology, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>AGEN 350, SCSC 301 and MATH 308 or their equivalent; graduate classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Hydrology of small agricultural watersheds; precipitation frequency analysis; infiltration; runoff; erosion theory; sediment transport theory; evapotranspiration, and use of hydrological models.</td>
</tr>
</tbody>
</table>

### BAEN 673 Modeling Small Watersheds

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 673 Modeling Small Watersheds, Credit 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Basic hydrology course and graduate classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Transport of water and chemicals in small agricultural watersheds; simulation using hydrologic models coupled with geographical information systems (GIS); impact of land use on the quality of surface water and groundwater evaluated.</td>
</tr>
</tbody>
</table>
### BAEN 674 Vadose Zone Hydrology

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 674 Vadose Zone Hydrology, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate Classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Fundamental concepts and advanced mathematical and experimental techniques for quantifying water, chemical, microorganism, and heat transport in the vadose zone (between soil surfaces and groundwater); provides a common platform for addressing issues related to soil and water resources, hydrology, geochemistry, microbiology, ecology, hydrogeology, and environmental engineering.</td>
</tr>
</tbody>
</table>

### BAEN 675 Hydrology Across Scale

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 675 Hydrology Across Scale, Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate classification in any engineering, agricultural science or geoscience program with environmental focus</td>
</tr>
<tr>
<td>Course Description</td>
<td>Advanced concepts of surface and subsurface hydrologic processes, measurements, and modeling techniques across different spatio-temporal scales; contemporary issues related to the soil and water resources, hydrogeology, geochemistry, microbiology, ecology, hydrology, and environmental engineering.</td>
</tr>
</tbody>
</table>

### BAEN 681 Seminar

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 681 Seminar, Credit 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Reviews, reports and discussion of ideas, recent advances and current topics.</td>
</tr>
</tbody>
</table>
### BAEN 683 Peer-Review Process and Publication

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 683 Peer-Review Process and Publication, Credit 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate classification in Biological and Agricultural Engineering only</td>
</tr>
<tr>
<td>Course Description</td>
<td>Techniques for communicating results of research that are defendable in a peer review process; student and advisor will select a research topic, identifying an appropriate target refereed journal; no thesis/dissertation preparation as a writing project accepted; critique other papers; prepare paper for review by instructor.</td>
</tr>
</tbody>
</table>

### BAEN 684 Professional Internship

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 684 Professional Internship, Credit 1 to 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate Classification or approval of instructor</td>
</tr>
<tr>
<td>Course Description</td>
<td>An on-the-job supervised experience program, conducted on an individual basis in the area of the student’s specialization in mechanized agriculture.</td>
</tr>
</tbody>
</table>

### BAEN 685 Directed Studies

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 685 Directed Studies, Credit 1 to 4 each semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate Classification</td>
</tr>
<tr>
<td>Course Description</td>
<td>Advanced laboratory or field problems not related to student’s thesis.</td>
</tr>
</tbody>
</table>
### BAEN 689 Special Topics in...

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 689 Special Topics in…, Credit 1 to 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>TBD</td>
</tr>
<tr>
<td>Course Description</td>
<td>Selected topics in an identified area of agricultural engineering. May be repeated for credit.</td>
</tr>
</tbody>
</table>

### BAEN 690 Theory of Research

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 690 Theory of Research, Credit 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Graduate Classification and approval of department head</td>
</tr>
<tr>
<td>Course Description</td>
<td>Development of research inquiry and discussion of applicable experimental design, theoretical techniques and methodological principles of conducting original research; evaluation of current research of faculty and students and in engineering and scientific literature. Communication of research proposals and results. May be repeated for credit.</td>
</tr>
</tbody>
</table>

### BAEN 691 Research

<table>
<thead>
<tr>
<th>Catalog Data</th>
<th>BAEN 691 Research, Credit 1 or more each semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>n/a</td>
</tr>
<tr>
<td>Course Description</td>
<td>Research for thesis or dissertation.</td>
</tr>
</tbody>
</table>
Appendix C
Faculty Research Funding

BIOLOGICAL & AGRICULTURAL ENGINEERING DEPARTMENT

This appendix presents the list of research contracts, grants, and gifts for the faculty members (located at College Station) of the Biological and Agricultural Engineering Department of Texas A&M University.
CAPAREDA, SERGIO

Title: Demonstration of Water Purification/Treatment/Recycling and Power Generation with Net Metering in a Commercial-Sized University Dairy Operated by the Dairy Industry
Funded: USDA-NRCS-CIG Grant
Amount: $783,283 Total: Cost Share: 425,811
Date: October 2014-September 2016
Co-PI: None

Title: Small Scale Wind Energy Development
Funded: Robert S. Conley Wind Energy Endowment
Amount: $80,000+
Date: 2005-present
Co-PI: None

Title: Renewable Energy and Environmental Sustainability Using Biomass from Animal Production Systems
Funded: US-DOE
Amount: $1M Total: Co-PI share: $92,275 (2005); $96,224 (2006)
Date: July 2005-May-2007
Co-PI: I am the Co-PI.

Title: Development of Downdraft Gasifier Fueled by Cotton Gin Trash
Funded: Cotton Foundation
Amount: $15,000/year beginning 2005
Date: 2005-2006
Co-PI: None

Title: Improvement of PM10 Emission Factors for Almond Harvesting Operations
Funded: The Almond Board of California
Amount: $28,000 (2004); $40,000 (2005); $80,000 (2006)
Date: 2003-Present
PI: S. C. Capareda and C.B. Parnell, Jr.

Title: Conversion of Temulose to Ethanol
Funded: Temple Inland
Amount: To be requested
Date: 2005
Co-PI: None

Title: Developing an Innovative Protocol to Measure reactive Organic gases (ROG’s) in Animal
Funded: Texas Cattle Feeders Association
Amount: $16,000 (one time)
Date: 2005
Co-PI: C.B. Parnell, Jr.

Title: Dynamometer Control Upgrade
Funded: PUF: TAES/COALS
Amount: $15,000 (one time)
Date: 2005
Co-PI: R.E. Lacey and S.C. Capareda

Title: Air Quality: Odor, Dust and Gaseous Emissions from Concentrated Animal Feeding Operations in the Southern Great Plains
Funded: USDA/CSREES
Amount: $27,623 (2005)
Date: 2002-2006
Co-PI: Drs. Parnell, Mukhtar, Shaw, Lacey, Sweeten, Auvermann, I am the Co-PI.
CASTELL-PEREZ, ELENA
Title: Use of Oxygen-Absorbing Packaging Material to Prolong Shelf Life of Rations
Funded: CORANET
Amount: $315,050
Date: 01/2006-12/2007
Co-PI: H.J. Sue (Mechanical Engineering) is the PI. I am the Co-PI.
Title: Improving safety of complex food items using electron beam technology
Funded: USDA/CSREES
Amount: $1,061,739
Date: 2002-2006
Co-PI: R.G. Moreira is the PI. I am the Co-PI.
Title: A powerful new approach to improve electron beam treatment of complex food items
Funded: USDA/NRI
Amount: $270,000
Date: 2002-2005
PI: R.G. Moreira is the PI. I am the Co-PI.
Title: Research in Food Rheology
Funded: Frito-Lay, Inc.
Amount: $10,000
Date: 2005-Present
Co-PI: none
Title: Low Dose Irradiation Effects on Quality and Shelf-Life of Selected Tropical Fruits
Funded: SureBeam Inc.
Amount: $25,000
Date: 2003
Title: Beam delivery strategy for treatment of irregularly shaped products.
Funded: ARP/Texas Board of Higher Education
Amount: $120,000
Date: 1999-2001
Co-PI: R.G. Moreira is the PI. I am the Co-PI.
Title: Evaluation of Non-Foil Film for MRE Applications
Funded: U.S. Army Natick RD&E Center
Amount: $499,115.71
Date: 1997-2000
Co-PI: D. Whitakker (TAMU) and R. Attaie (PVAMU)
Title: An Integrated Scientific Approach for Studying the Quality Parameters and Technologies for Combat Ration Quality Enhancements.
Funded: U.S. Army Natick RD&E Center
Amount: $1,247,665
Date: 1994-1996
PI: Rao (AAMU) is the PI. I am the Co-PI.
Title: Operational Ration Components Based on Flour Derived from Arachis hypogaea
Funded: U.S. Army Natick RD&E Center
Amount: $200,624
Date: 1991-1994
Co-PI: Rao (AAMU) is the PI. I am the Co-PI.
CASTELL-PEREZ, ELENA

Title: Operational Ration Components Based on Flour Derived from Arachis hypogaea
Funded: $ 200,624
Date: R. Rao (AAMU) is the PI. I am the Co-PI.
Co-PI: Development of Appropriate Technology for New and Improved Weaning Foods and Detoxification in Peanuts
Funded: USAID Peanut CRSP
Amount: 125,000/year
Date: 1996-1999
Co-PI: V. Owosu, J. Anderson (AAMU)
Title: Understanding Changes in Food Rheology and Structure due to Microwave Heating: An Engineering Approach
Funded: USDA CSREES
Amount: $ 167,300
Date: 1994-1996
Co-PI: None
Title: Understanding and Modifying Rheology of Dough due to Storage and Composition
Funded: USDA NRICGP Seed Grant
Amount: $50,000
Date: 1994-1996
Co-PI: None
Title: An Interdisciplinary Approach to Optimum Food Utility in SAT (Semi-Arid Tropic) Africa
Funded: USAID Peanut CRSP
Date: 1993-1996
Co-PI: O. Okezie (AAMU)
ENGLER, CADY R.

Title: Renewable energy and environmental sustainability using biomass from animal production systems
Funded: DOE
Amount: $78,375
Date: 2005-2008
Co-PI: K. Anamali, J.M. Sweeten

Title: Enhanced-rate biodegradation using immobilized non-growing organisms
Funded: Texas Hazardous Waste Research Center
Amount: $92,609
Date: 2001-2004
Co-PI: J.R. Wild

Title: Technological innovations for amelioration of livestock contributions to climate change
Funded: Texas Advanced Technology Program
Amount: $100,000
Date: 1996-1997
Co-PI: F.M. Byers, S.C. Ricke

Title: Biogas digesters for treatment of dairy waste: Phase II, renovation of the Carrell Dairy mesophilic digester
Funded: EPA Region VI/Texas Soil and Water Conservation Board
Amount: $160,000
Date: 1995-1999
Co-PI: J.M. McFarland

Title: Biogas digesters for treatment of dairy waste: Phase I, renovation of the Carrell Dairy mesophilic digester
Funded: EPA
Amount: $160,000
Date: 1994-1995
Co-PI: J.M. McFarland

Funded: Advanced concepts in the production and biological pretreatment of biomass
Funded: Gas Research Institute
Amount: $160,895
Date: 1987-1990
Co-PI: None

Title: Interactions between research areas within Texas and within the guayule growing region
Funded: USDA
Amount: $100,000
Date: 1984-1985
Co-PI: J. Moore

Title: Guayule processing line
Funded: U.S. Department of Defense
Amount: $270,000
Date: 1983-1984
Co-PI: None

Title: Process development for commercial production of natural rubber from guayule
Funded: U.S. Department of Commerce
Amount: $188,119
Date: 1982-1983
Co-PI: None
<table>
<thead>
<tr>
<th>ENGLER, CADY R.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title:</strong></td>
<td>Economic and engineering evaluation of plant oils as a diesel fuel</td>
</tr>
<tr>
<td><strong>Funded:</strong></td>
<td>Texas Energy and Natural Resources Advisory Council</td>
</tr>
<tr>
<td><strong>Amount:</strong></td>
<td>$150,000</td>
</tr>
<tr>
<td><strong>Date:</strong></td>
<td>1981-1983</td>
</tr>
<tr>
<td><strong>PI:</strong></td>
<td>W.A. LePori, L.A. Johnson</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Engineering evaluation of cottonseed oil and animal fats as diesel fuels</td>
</tr>
<tr>
<td><strong>Funded:</strong></td>
<td>USDA</td>
</tr>
<tr>
<td><strong>Amount:</strong></td>
<td>$125,000</td>
</tr>
<tr>
<td><strong>Date:</strong></td>
<td>1981-1984</td>
</tr>
<tr>
<td><strong>CO-PI:</strong></td>
<td>W.A. LePori, L.A. Johnson</td>
</tr>
</tbody>
</table>
FAULKNER, BROCK

Title: Algal Oil Extraction and Deoxygenation to Hydrocarbon Fuels
Funded: Texas AgriLife Research Bioenergy Initiatives Program
Amount: $155,000
Date: 2009-2011
Co-PI: I am the Co-PI

Title: Characterization of Large Particle Transmission in FRM PM$_{10}$ Samplers: Impact on PM Regulation in Rural Environments
Funded: Texas AgriLife Research Air Quality Research Program
Amount: $155,000
Date: 2011-2013
Co-PI: None

Title: Baseline Inventory of Greenhouse Gas Emissions from Beef Cattle Feedyards
Funded: Texas AgriLife Research Air Quality Research Program
Amount: $140,000
Date: 2011-2013
Co-PI: Kenneth Casey

Title: Equipment Support for Purchase of Aerodynamic Particle Sizer
Funded: Texas AgriLife Research
Amount: $37,000
Date: 2013
Co-PI: None

Title: Improving the Accuracy of PM$_{10}$ Measurements from Agricultural Sources
Funded: Texas AgriLife Research Air Quality Research Program
Amount: $155,088
Date: 2013-2015
Co-PI: None

Title: Maximizing Cotton Quality during Storage and Ginning
Funded: Texas AgriLife Research Fibers Initiative
Amount: $30,000
Date: 2013-2015
Co-PI: None

Title: Harvest Efficiency of Modern Cotton Harvesting Machinery
Funded: Cotton Incorporated
Amount: $80,000
Date: 2007-2012
Co-PI: John D. Wanjura

Title: Evaluation of Ambient Particulate Matter Sampler Performance
Funded: USDA-CSREES National Research Initiative
Amount: $359,038
Date: 2007-2010
Co-PI: None

Title: Improving PM (PM$_{10}$ and PM$_{2.5}$) Emissions from Almond Sweeping and Harvesting Operations
Funded: Almond Board of California
Amount: $83,225
Date: 2009-2010
Co-PI: Sergio Capareda

Title: Air Quality: Reducing Emissions from Cattle Feedlots and Dairies
Funded: USDA-CSREES
Amount: $80,000
Date: 2009-2011
Co-PI: John Sweeten et al.
FAULKNER, BROCK

Title: Harvesting and Ginning Practices to Maximize the Value of High Plains Cotton
Funded: Texas Department of Agriculture Food and Fibers Research Grant Program
Amount: $60,000
Date: 2009-2011
Co-PI: John Wanjura

Title: Harvesting and Ginning Practices to Maximize the Value of High Plains Cotton
Funded: Cotton Incorporated - Texas State Support Committee
Amount: $30,000
Date: 2010-2012
Co-PI: John Wanjura

Title: Evaluation of Electrostatic Particle Ionization and BioCurtain Technologies to Reduce Dust, Odor, and Other Pollutants from Broiler Houses
Funded: Texas Soil and Water Conservation Board – Poultry Program
Amount: $169,624
Date: 2010-2012
Co-PI: I am the Co-PI

Title: Summarization of PM Emissions from Almond Harvest Research
Funded: Almond Board of California
Amount: $20,953
Date: 2010-2011
Co-PI: Sergio Capareda

Title: Reducing PM Emissions from Almond Harvest Operations through Innovative Harvester Design
Funded: USDA-NRCS and the San Joaquin Valley Unified Air Pollution Control District
Amount: $150,000
Date: 2010-2011
Co-PI: None

Title: Continuing Professional Development Workshop on Particulate Matter Measurement
Funded: USDA-CSREES through the Air Quality Education for Animal Agriculture Project
Amount: $6,000
Date: 2010
Co-PI: None

Title: Optimization of Cottonseed Dehulling Processes
Funded: Cotton Incorporated
Amount: $87,900
Date: 2011-2013
Co-PI: None

Title: Evaluation of Spray Nozzles to Reduce PM Emissions from Tillage Operations
Funded: California State University at Fresno
Amount: $9,000
Date: 2011
Co-PI: None

Title: Ginning Practices to Improve the Value of High Plains Cotton
Funded: Texas Department of Agriculture
Amount: $20,000
Date: 2011-2012
Co-PI: John Wanjura

Title: Policy-Relevant Analysis of Results of Federal Air Quality Initiative
Funded: USDA National Institute for Food and Agriculture
Amount: $25,000
Date: 2012-2013
Co-PI: Brent Auvermann

**FAULKNER, BROCK**

Title: Evaluation of Low Volume TSP Sampler for Measuring Agricultural PM$_{10}$ and PM$_{2.5}$
Funded: Cotton Foundation
Amount: $72,000
Date: 2011-2015
Co-PI: Calvin Parnell

Title: Storability of Stripped Cotton in Round Modules
Funded: Cotton Incorporated (Texas State Support Committee and Core Funds)
Amount: $55,000
Date: 2013-2015
Co-PI: John Wanjura

Title: Characterization of High Volume PM2.5 Particulate Sampler Performance
Funded: Tisch Environmental
Amount: $42,400
Date: 2013-2014
Co-PI: None

Title: Timing Manure Management Activities to Reduce Nitrogen Deposition in Rocky Mountain National Park
Funded: USDA Natural Resources Conservation Service
Amount: $159,126
Date: 2013-2016
Co-PI: Russ Schumacher

Title: Effect of Particle Size and Air Exchange Rate on Particle Concentrations within a Reduced-Scale Room
Funded: MSS Services (Subcontractor for National Institute of Health (HHSN2922009000017I))
Amount: $36,000
Date: 2013-2014
Co-PI: Gerald Riskowski

Title: Feasibility Study of Potential Methods for Improving Warehouse Efficiencies
Funded: Cotton Incorporated
Amount: $84,500
Date: 2014-2015
Co-PI: None

Title: Development of a Pilot-Scale Guar Splitting Process
Funded: Southwest Agriculture, LLC
Amount: $12,500
Date: 2014-2015
Co-PI: None

Title: PQ200 Air Flow Control Unit
Funded Tisch Environmental
Amount: $9,900
Date: 2014
Co-PI: None
FERNANDO, SANDUN

Title: EAGER: Iron-sulfide based Molecular-wires for Enhancing Charge Transport of Enzymatic Electrode Assemblies
Funded: National Science Foundation (NSF)
Amount: $62,000
Date: National Science Foundation (NSF) to 62000
Co-PI: None

Title: Development of Refinery-Grade Bio-oil with Consistent Properties Using Blended Feedstocks
Funded: Texas Agrilife Research
Amount: $60,000
Date: 8/1/2012 to 7/31/2013
Co-PI: Capareda

Title: Algal Biofuels Technology to Transform the World
Funded: Texas Office of the Governor
Amount: $17,000
Date: 8/1/2011 to 5/31/2012
Co-PI: None

Title: Algal Biofuels Research
Funded: Corporate Relations, Texas Agrilife Research
Amount: $5,376
Date: 8/1/2011 to 5/31/2012
Co-PI: None

Title: Development of Refinery-Grade Bio-oil with Consistent Properties Using Blended Feedstocks
Funded: Texas Agrilife Research
Amount: $100,000
Date: 8/1/2011 to 7/31/2012
Co-PI: Capareda

Title: National Alliance for Advanced Biofuels and Bioproducts
Funded: U.S. Department of Energy (DOE) via The Donald Danforth Plant Science Center
Amount: $44 million
Date: 4/1/2010 to 3/31/2013
Co-PI: A multi-state, multi-institutional team
FERNANDO, SANDUN

Title: Towards Sustainable Hydrocarbon Biorefineries: Deoxygenation of Biomass Oxygenates to HCs via Methane
Funded: National Science Foundation (NSF)
Amount: $318,274
Date: 4/1/2010 to 3/31/2014
Co-PI: None

Title: National Alliance for Advanced Biofuels and Bioproducts
Funded: U.S. Department of Energy (DOE) via The Donald Danforth Plant Science Center
Amount: $44 million
Date: 4/1/2010 to 3/31/2011
Co-PI: None

Title: REU Supplement: Towards Sustainable Hydrocarbon Biorefineries: Deoxygenation of Biomass Oxygenates to Hydrocarbons via Methane
Funded: National Science Foundation (NSF)
Amount: $12,500
Date: 4/1/2010 to 3/31/2013
Co-PI: None

Title: Acquisition of a PicoTREC Coupled Atomic Force Microscope System
Funded: Texas Agrilife Research
Amount: $30,000
Date: 8/31/2009
Co-PI: None

Title: Enhancing the Quality of Marketable Products Derived from Mobile Fast Pyrolysis of Ligno-cellulosic Biomass
Funded: Texas Agrilife Research
Amount: 330,000
Date: 8/1/2009 to 7/31/2011
Co-PI: Capareda, Munster, Provin

Title: Algal Oil Extraction and Deoxygenation to Hydrocarbon Fuels
Funded: Texas Agrilife Research
Amount: $130,000
Date: 8/1/2009 to 7/31/2011
Co-PI: None
FERNANDO, SANDUN

Acquisition of an Atomic Force Microscope (Supplement to the grant “Heterogeneous Emulsion Catalysis: Transesterification using Amphiphilic Catalysts in Nanoemulsion Environments”)
Title: Acquisition of an Atomic Force Microscope (Supplement to the grant “Heterogeneous Emulsion Catalysis: Transesterification using Amphiphilic Catalysts in Nanoemulsion Environments”)
Funded: National Science Foundation (NSF)
Amount $35,000
Date: 2009
Co-PI None

Request for Research Equipment Mobile Fluidized-bed Pyrolysis System
Title: Request for Research Equipment Mobile Fluidized-bed Pyrolysis System
Funded: Texas Agrilife Research - PUF
Amount $70,000
Date: 11/5/2008 to 5/1/2009
Co-PI None

Acquiring of a High Pressure Homogenizer to Develop an Oil Extraction Technique from High Moisture Algal Biomass
Title: Acquiring of a High Pressure Homogenizer to Develop an Oil Extraction Technique from High Moisture Algal Biomass
Funded: Texas Agrilife Research
Amount $25,000
Date: 9/1/2008 to 8/31/2009
Co-PI None

Preparing Underrepresented Scholars for Challenges in Agriculture Bioenergy and Sustainability - a Research and Leadership PhD Program
Title: Preparing Underrepresented Scholars for Challenges in Agriculture Bioenergy and Sustainability - a Research and Leadership PhD Program
Funded: USDA – National Needs Fellowships
Amount $234,000
Date: 9/1/2008 to 8/13/2013
Co-PI Capareda, Munster, Provin, Palma, Vieter

Heterogeneous Emulsion Catalysis: Transesterification using Amphiphilic Catalysts in Nanoemulsion Environments
Title: Heterogeneous Emulsion Catalysis: Transesterification using Amphiphilic Catalysts in Nanoemulsion Environments
Funded: National Science Foundation (NSF)
Amount $323,624
Date: 8/15/2008 to 12/31/2012
Co-PI None

SGER: Catalytic Reforming of Electrically Charged Glycerin Nano-droplets to Produce Hydrogen
Title: SGER: Catalytic Reforming of Electrically Charged Glycerin Nano-droplets to Produce Hydrogen
Funded: National Science Foundation (NSF)
Amount $44,682
Date: 8/15/2007 to 10/15/2008
Co-PI None
FERNANDO, SANDUN

Title: Development of a Bioadsorbent for the Biodiesel Industry
Funded: Mississippi Development Authority via US Department of Energy
Amount $220,000
Date: 8/1/2006 to 6/30/2007
Co-PI None

Title: Biomass Based Energy Research
Funded: Oklahoma State University / U.S. Department of Agriculture
Amount $525,364
Date: 7/1/2006 to 6/8/2008
Co-PI I was the co-PI, Columbus (PI), Gilbert

Title: Investigation of Technical Barriers Effecting Biobased Syngas Production, Utilization, and Conversion
Funded: USDOE/SERC
Amount $652,695
Date: 6/1/2006 to 11/30/2007
Co-PI I was the Co-PI, Hernandez (PI), French

Title: Development of Fuels and Chemical Co-Products from Bio-Oils
Funded: USDOE/SERC
Amount $1,162,953
Date: 6/1/2006 to 11/30/2007
Co-PI I was the co-PI, Bricka

Title: Biomass Utilization
Funded: USDOE/SERC
Amount $1,522,470
Date: 6/1/2006 to 11/30/2007
Co-PI I was the co-PI, Bricka, Hernandez, Steele

Title: Novel Processes and Feedstocks for Producing Biodiesel
Funded: USDOE/SERC
Amount $1,651,742
Date: 6/1/2006 to 11/30/2007
Co-PI I was the co-PI, Hernandez (PI), French
FERNANDO, SANDUN

Title: Hydrogen Production from Biorefinery Co-products and Effluents
Funded: USDOE - Sustainable Energy Research Center (SERC)
Amount: $701,344
Date: 6/1/2006 to 11/30/2007
Co-PI: I was the co-PI, Chamra (PI), Steele

Title: Oxidatively and Thermally Stable, Polymerization Resistant Industrial Lubricants from Chemically Modified Soybean Oil
Funded: Mississippi Soybean Promotion Board
Amount: $32,044
Date: 4/1/2006 to 3/31/2007
Co-PI: None

Title: Biomass Based Energy Research
Funded: Oklahoma State University / U.S. Department of Agriculture
Amount: $448,730
Date: 7/1/2005 to 6/30/2007
Co-PI: I was the co-PI, Columbus (PI), Gilbert

Title: Identify and Characterize Biomass Materials, Optimize Gasification Processes, and Enrich Biofuels for Micro-CHP-systems.
Funded: USDOE/SERC
Amount: $1,500,000
Date: 6/17/2005 to 9/14/2007
Co-PI: I was the co-PI, Chamra (PI), Steele

Title: Mississippi State Biodiesel Production Project: Development and Optimization of Novel Biodiesel Production Techniques
Funded: USDOE/SERC
Amount: $2,470,000
Date: 9/1/2004 to 9/29/2007
Co-PI: I was the co-PI, Hernandez (PI), French

Title: Biomass Based Energy Research
Funded: Oklahoma State University / U.S. Department of Agriculture
Amount: $450,000
Date: 7/1/2004 to 6/30/2006
Co-PI: I was the co-PI, Columbus (PI), Gilbert

Title: Research Initiate Grant
Funded: Mississippi State University - Office of Research
Amount: $10,000
Date: 1/1/2004 to 12/31/2004
### KARTHIKEYAN, RAGHUPATHY

<table>
<thead>
<tr>
<th>Title</th>
<th>Funded</th>
<th>Amount</th>
<th>Date</th>
<th>PIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of a watershed protection plan for Mill Creek</td>
<td>EPA-TSSWCB</td>
<td>$300,000</td>
<td>2012-2015</td>
<td>M. McFarland, R. Karthikeyan, and R. Srinivasan</td>
</tr>
<tr>
<td>Basins approach to address bacterial impairments in basins 15, 16, and 17</td>
<td>EPA-TSSWCB</td>
<td>$120,000</td>
<td>2012-2015</td>
<td>K. Wagner, R. Karthikeyan, and T. Gentry</td>
</tr>
<tr>
<td>Assessment of <em>E. coli</em> pollution from OSSFs to Galveston Bay</td>
<td>Texas General Land Office</td>
<td>$166,156</td>
<td>2012-2014</td>
<td>C. Munster, R. Karthikeyan, and J. Jacob</td>
</tr>
<tr>
<td>TMDL and TMDL I plan development for Copano Bay</td>
<td>EPA-TCEQ</td>
<td>$17,046</td>
<td>2012-2013</td>
<td>A. Berthold and R. Karthikeyan</td>
</tr>
<tr>
<td>Texas watershed planning, training, and coordination project</td>
<td>EPA-TCEQ</td>
<td>$198,143</td>
<td>2010-2013</td>
<td>K. Wagner, R. Karthikeyan, and R. Srinivasan</td>
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<tr>
<td>Development of a watershed protection plan for Geronimo Creek Watershed, TX</td>
<td>EPA-TSSWCB</td>
<td>$792,513</td>
<td>2009-2012</td>
<td>M. McFarland, R. Karthikeyan, and R. Srinivasan</td>
</tr>
</tbody>
</table>
KENIMER, ANN

Title: Information Technology in Science Centers for Teaching and Learning. Cohort III. The Water Environment
Funded: NSF
Amount: $100,000
Date: 2004-2006
Co-PI: P. Haan

Title: Information Technology in Science Center for Teaching and Learning. Cohort II. Sustainable coastal margins
Funded: NSF
Amount: $160,000
Date: 2002-2004
Co-PI: B. Herbert, S. Brody, A. Cahill

Title: Foundation Coalition; Year 10. Assessment and Evaluation Project: Field testing of assessment and evaluation instruments
Funded: NSF
Amount: $391,491
Date: 2002-2003
Co-PI: R. Caso-Esposito, T. Powers, S. Haag, T. Litzinger, B. Notaros, J. Richardson, J. Buck, R. Griffin

Title: University Curriculum Development for Decentralized Wastewater Management
Funded: USEPA
Amount: Total requested $191,565. TAES subcontract: $43,036
Date: 2001-2004
Co-PI: B. J. Lesikar

Title: Foundation Coalition; Year 9. Assessment and Evaluation Project: Field testing and marketing of assessment and evaluation instruments
Funded: NSF
Amount: $320,679
Date: 2001-2002

Title: Foundation Coalition; Year 8. Assessment and Evaluation Project: Marketing assessment and evaluation programs
Funded: NSF
Amount: $284,000
Date: 2000-2001

Title: Development of an urban watershed rehabilitation method using stakeholder feedback to direct investigation and restoration planning
Funded: USEPA/NSF
Amount: $838,700
Date: 1998-2001

Title: Water quality benefits of precision farming
Funded: TSSWCB/USEPA, Section 319(h) Nonpoint Source Pollution Program
Amount: $300,066
Date: 1997-2000
Co-PI: G. J. Sabbagh, S. W. Searcy
KENIMER, ANN

Title: Wetlands for nonpoint source pollution control from small agricultural watersheds
Funded: TSSWCB/USEPA, Section 319(h) Nonpoint Source Pollution Program
Amount: $383,029
Date: 1996-1999

Title: Natural systems for agricultural wastewater treatment and water quality management
Funded: USDA Challenge Grant
Amount: $151,107. TAES subcontract: $40,000.
Date: 1996-1999
Co-PI: S. Chen

Title: A spatial decision support system for water quality management
Funded: USDA/CSREES Special Water Quality Grant
Amount: $1,930,000. TAES subcontract: $577,909
Date: 1995-1999
Co-PI: R. Srinivasan
**LACEY, RON**

<table>
<thead>
<tr>
<th>Title</th>
<th>Funded</th>
<th>Amount</th>
<th>Date</th>
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<tbody>
<tr>
<td>Production of Biodiesel from Microalgae</td>
<td>General Atomics / Department of Defense,</td>
<td>$573,300</td>
<td>2007 – 2011</td>
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<tr>
<td>Evaluation of Ammonia (NH3) Monitoring Instruments in Differentiating NH3 and Ammonium</td>
<td>(NH4OH) Measurement</td>
<td>$10,000</td>
<td>2005 - 2006</td>
<td>Dr. John Carey</td>
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<tr>
<td>Plant Growth at Sub-Ambient Atmospheric Pressures with Control of the Partial Pressures of Constituent Gases</td>
<td>NASA Advanced Human Support Technologies Program (NASA NRA 03-OBPR-01), $809,567 total. Because of NASA budget constraints the total amount was revised on February 20, 2006 to $629,846.</td>
<td>2004 – 2007</td>
<td>Dr. Fred Davies</td>
<td></td>
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<tr>
<td>Title</td>
<td>Funded</td>
<td>Amount</td>
<td>Date</td>
<td>Co-PI</td>
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<tr>
<td>Evaluation of Ammonia (NH₃) Monitoring Instruments in Differentiating NH₃ and Ammonium (NH₄OH) Measurement</td>
<td>U.S. Poultry and Egg (0405-E001)</td>
<td>$10,000</td>
<td>2005 - 2006</td>
<td>Dr. John Carey</td>
</tr>
<tr>
<td>Plant Growth at Sub-Ambient Atmospheric Pressures with Control of the Partial Pressures of Constituent Gases</td>
<td>NASA Advanced Human Support Technologies Program (NASA NRA 03-OBPR-01),</td>
<td>$809,567 total. Because of NASA budget constraints the total amount was revised on February 20, 2006 to $629,846.</td>
<td>2004 – 2007</td>
<td>Dr. Fred Davies</td>
</tr>
<tr>
<td>Effects of Urbanization on Ecological Services in a Semi-arid Region of the United States</td>
<td>NASA Land Cover-Land Use Change Program (NRA-00-OES-08)</td>
<td>$599,234</td>
<td>2001 - 2005</td>
<td>Drs. Urs Kreuter, Richard Conner, and Patricia Haan</td>
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<tr>
<td>Supplemental grant for Plant Growth and Metabolism at Sub-Ambient Atmospheric Pressures</td>
<td>NASA Advanced Human Support Technologies Program</td>
<td>$109,000</td>
<td>2003 – 2004</td>
<td>Dr. Fred Davies</td>
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<tr>
<td>Plant Growth and Metabolism at Sub-Ambient Atmospheric Pressures</td>
<td>NASA Advanced Human Support Technologies Program (98-HEDS-01)</td>
<td>$470,771</td>
<td>1999-2002</td>
<td>Dr. Fred Davies</td>
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<tr>
<td>Monitoring and Control of Biogas Production</td>
<td>Texas A&amp;M University System Energy Resources Program</td>
<td>$25,000</td>
<td>1997-1998</td>
<td>Drs. Steve Ricke and Cady Engler</td>
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</table>
LACEY, RON
Title: Characterization of Swine Odors by an Electronic Nose
Funded: National Pork Producers Council
Amount: $30,000
Date: 1996-1997
Co-PI: N/A

Title: Characterization of Anaerobic Lagoons by Methane Emissions
Funded: USDA, NRCS
Amount: $50,000
Date: 1996-1997
Co-PI: Dr. Cady Engler

Title: Development of Elastography for Non-invasive Quantification of Textural Behavior in Packaged Food Rations
Funded: US Army Research and Development
Amount: $200,000
Date: 1995-1997
Co-PI: N/A

Title: Nondestructive Measurement of Biological and Food Materials
Funded: Agricultural Experiment Station
Amount: $45,000
Date: 1993-1995
Co-PI: Drs. Don Bender and Dale Whittaker

Title: Vacuum Drying of Pepperoni
Funded: Rosani Foods, Dallas, Texas
Amount: $15,000
Date: 1993
Co-PI: Dr. Jimmie Keeton
<table>
<thead>
<tr>
<th>Title</th>
<th>Funded</th>
<th>Amount</th>
<th>Date</th>
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<tbody>
<tr>
<td>Public Outreach and Education Programs</td>
<td>Texas Commission on Environmental Quality</td>
<td>$44,012</td>
<td>2004</td>
<td>none</td>
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<tr>
<td>Practitioner Training Development Program</td>
<td>Water Environment Research Foundation</td>
<td>$240,000</td>
<td>2004</td>
<td>none</td>
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<tr>
<td>Graywater Literature Review</td>
<td>San Antonio Water System</td>
<td>$10,631</td>
<td>2003</td>
<td>none</td>
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<tr>
<td>On-site Wastewater Treatment Training Center Upgrades</td>
<td>Texas On-site Wastewater Treatment Research Council</td>
<td>$23,400</td>
<td>2003</td>
<td>none</td>
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<tr>
<td>Texas Agrability Project</td>
<td>United States Department of Agriculture, Cooperative State Research, Education, and Extension</td>
<td>$600,000 - direct responsibility for $99,751</td>
<td>2003-06</td>
<td>none</td>
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<tr>
<td>Groundwater Management Educational Materials – II</td>
<td>Texas Natural Resource Conservation Commission</td>
<td>$40,000</td>
<td>2002</td>
<td>none</td>
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<tr>
<td>Groundwater Management Educational Materials</td>
<td>Texas Natural Resource Conservation Commission</td>
<td>$30,000</td>
<td>2001</td>
<td>none</td>
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<tr>
<td>Well Closure Curriculum Materials</td>
<td>Texas Natural Resource Conservation Commission</td>
<td>$39,000</td>
<td>2000</td>
<td>none</td>
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<tr>
<td>Abandoned Well Closure Video</td>
<td>Texas Natural Resource Conservation Commission</td>
<td>$40,000</td>
<td>June 1, 1999 - August 31, 1999</td>
<td>none</td>
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</table>
**LESIKAR, BRUCE**

<table>
<thead>
<tr>
<th>Title</th>
<th>Funded</th>
<th>Amount</th>
<th>Date</th>
<th>Co-PI</th>
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<tbody>
<tr>
<td>Title: Wastewater Treatment Educational Materials.</td>
<td>Funded: Houston Galveston Area Council, 319(h) Grant</td>
<td>$58,266</td>
<td>May 20, 1999 - August 31, 2000</td>
<td>none</td>
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<tr>
<td>Title: Characteristics of soil media where subsurface drip systems are being used to distribute residential wastewater</td>
<td>Funded: On-Site Wastewater Treatment Research Council</td>
<td>$52,700</td>
<td>June 1, 1998 - June 31, 1999</td>
<td>none</td>
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<tr>
<td>Title: Removal and Fate of Specific Microbial Pathogens Within On-Site Wastewater Treatment Systems</td>
<td>Funded: Texas On-Site Wastewater Treatment Research Council</td>
<td>$58,800, direct responsibility for $9,800</td>
<td>June 1, 1998 - August 31, 1999</td>
<td>Suresh Pillai</td>
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<tr>
<td>Title: On-Site Wastewater Treatment Educational Materials</td>
<td>Funded: On-Site Wastewater Treatment Research Council</td>
<td>$89,000</td>
<td>June 1, 1998 to March 31, 1999</td>
<td>none</td>
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<tr>
<td>Title: On-Site Wastewater Treatment System: Constructed Wetland</td>
<td>Funded: Seco Creek Water Quality Demonstration Project</td>
<td>$4,000</td>
<td>1997-August 1999</td>
<td>none</td>
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<tr>
<td>Title: On-Site Wastewater Treatment System: Constructed Wetland.</td>
<td>Funded: Upper North Bosque Hydrologic Unit Area Project</td>
<td>$4,000</td>
<td>1997-August 1998</td>
<td>none</td>
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<tr>
<td>Title: Bioremediation of Nursery and Greenhouse Effluent Using Constructed Wetlands and Subsequent Recycling for Irrigation of Ornamental Plants Grown in Organic Composts</td>
<td>Funded: Cooperator</td>
<td>$20,800</td>
<td>1997</td>
<td>none</td>
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<tr>
<td>Title: Construction of Two Subsurface Flow Constructed Wetland Demonstration Projects</td>
<td>Funded: Lower Colorado River Authority</td>
<td>$27,906</td>
<td>June 1, 1996 - July 31, 1996</td>
<td>none</td>
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<tr>
<td>Title: On-Site Wastewater Treatment Training Center, El Paso</td>
<td>Funded: On-Site Wastewater Treatment Research Council</td>
<td>$79,000</td>
<td>May 1, 1996 - August 31, 1997</td>
<td>none</td>
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<tr>
<td>Title</td>
<td>Funded</td>
<td>Amount</td>
<td>Date</td>
<td>Co-PI</td>
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<tr>
<td>On-Site Wastewater Treatment Training Center, Weslaco</td>
<td>On-Site Wastewater Treatment Research Council</td>
<td>$64,000</td>
<td>May 1, 1996 - August 31, 1997</td>
<td>none</td>
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<tr>
<td>Design of Marine Wastewater Pumpout Stations for the Pumpout Demonstration Project</td>
<td>General Land Office</td>
<td>$9,973</td>
<td>February 1, 1996 - June 30, 1996</td>
<td>none</td>
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<tr>
<td>Evaluation of Constructed Wetland Systems for Wastewater Treatment and Reuse in Rural Mexican Communities</td>
<td>Kellogg Foundation</td>
<td>$5,000</td>
<td>1996</td>
<td>none</td>
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<tr>
<td>On-Site Wastewater Treatment Training Center, Operation and Maintenance</td>
<td>On-Site Wastewater Treatment Research Council</td>
<td>$35,000</td>
<td>December 1, 1995 - January 31, 1997</td>
<td>none</td>
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<tr>
<td>Constructed Wetlands for Prevention of Nonpoint Source Pollution Caused by Onsite Sewage Disposal</td>
<td>USEPA 319(h) Urban Program Administered through TNRCC</td>
<td>$300,000</td>
<td>1995-1998</td>
<td>none</td>
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<tr>
<td>Living Cap Seedbed Preparation using a Disk-Chain-Diker</td>
<td>Union Carbide Texas City Plant</td>
<td>$6,830</td>
<td>1995</td>
<td>Harold Wiedemann</td>
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<tr>
<td>On-Site Wastewater Treatment Training Center: Bryan</td>
<td>On-Site Wastewater Treatment Research Council</td>
<td>$69,000</td>
<td>August – September 1995</td>
<td>none</td>
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<tr>
<td>Constructed Wetland Technology for Treatment of Residential (Colonias) and Processing Wastewater</td>
<td>Research Enhancement Program</td>
<td>$76,340</td>
<td>September 1, 1993 - August 31, 1995</td>
<td>none</td>
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</tbody>
</table>
LESIKAR, BRUCE

Title: Intermittent Sand Filters for Improving Effluent Water Quality of On-Site Wastewater Treatment Systems
Funded: On-Site Wastewater Treatment Research Council
Amount: $50,000
Date: 1993-1995
Co-PI: none

Title: Cyclone Design for Axial-Flow Fan Exhaust Systems
Funded: National Cotton Foundation
Amount: $26,782
Date: 1993-1994
Co-PI: none

Title: Technical Assessment of Feedlot Dust as an Environmental Liability for the Cattle Feeding Industry
Funded: National Cattleman's Association
Amount: $9,500
Date: 1992-1993
Co-PI: none

Title: Solid Waste Management
Funded: Texas Water Commission, 1992-93
Amount: $19,650
Date: 1992-1993
Co-PI: none

Title: Agricultural Chemicals in Ground Water
Funded: Texas Water Commission, 1992-93
Amount: $5,000
Date: 1992-1993
Co-PI: none
MOHANTY, BINAYAK

Title: Ph.D. Fellowship for Nandita Gaur, “A New Heterogeneity Triangle to Characterize Land–Surface Heterogeneity for Estimating Near-Surface Soil Moisture Beyond Darcy Scale”
Funded: NASA-ESS (Earth System Science):
Amount: $60,000
Date: 09/13-08/15
Co-PI: None

Title: Planning Grant: Sustaining Rangelands in the Southern Great Plains in the 21st Century: Adapting to Mitigating for Climate Change
Funded: USDA-AFRI (Agriculture and Food Research Initiative):
Amount: $50,000
Date: 09/10-09/11
Co-PI: Role – Co-Investigator. (PI: Wilcox, Ecosystems Science and Management)

Title: Development of Riverware Model of the Rio Grande for Water resources Management in the Paso Del Norte Watershed
Funded: ARMY (US Army Corp of Engineers)
Amount: $200,000
Date: 09/10-09/11
Co-PI: Role - Co-Principal Investigator. (PI: Sheng, TAES, El Paso, Texas)

Title: WATer Engineering Research Scholars (WATER Scholars)
Funded: NSF-S-STEM (Scholarships in Science, Technology, Engineering, and Mathematics)
Amount: $597,978
Date: 01/10-12/15
Co-PI: Role - Co-Principal Investigator. (PI: Autenrieth, Civil Engineering)

Title: Predictive Modeling of Thermally Driven Hydrologic Fluxes for Land and Atmosphere Interactions Across Space and Time Scales
Funded: NSF-CMG (Collaborative Mathematical Sciences and Geosciences)
Amount: $450,000
Date: 09/09-09/14
Co-PI: Role - Principal Investigator. (Co-PIs: Efendiev and Sviercoski, Mathematics)

Title: Multi-Platform Soil Moisture Scaling over the Southern Great Plains Using In Situ, Satellite Retrieval, and Data Assimilation
Funded: NASA-THP (Terrestrial Hydrology Program)
Amount: $872,334
Date: 01/09-08/15
Co-PI: Role - Principal Investigator. (Co-PI: Jackson, USDA)

Title: Institute for Applied Mathematics and Computational Science (IAMCS) at Texas A&M University
Funded: KAUST (King Abdullah University of Science and Technology)
Amount: $25 million
Date: 06/08-05/14
Co-PI: Role - Co-Investigator (Earth Sciences Application). (PI: Calvin, Statistics)
MOHANTY, BINAYAK

Title: Development of Riverware Model of the Rio Grande Flow and a Coordinated Database for Water Related Resources in the Rio Grande Project Watershed

Funded: ARMY (US Army Corp of Engineers)
Amount: $200,000
Date: 09/07-09/08
Co-PI: Role - Co-Investigator. (PI: Sheng, TAES, El Paso, Texas)

Title: Nitrates, Nitrites, and Nitrosatable Drugs and Risk of Selected Birth Defects

Funded: NIH-HIEHS (National Institute for Environmental Health Sciences)
Amount: $1.42 million
Date: 05/07-04/13
Co-PI: Role - Co-Principal Investigator. (PI: Brender, Health Science)

Title: Physical Controls of Soil Moisture and Vadose Zone Fluxes Across Space-Time Scales Under Different Hydro-Climatic Conditions

Funded: NASA-THP (Terrestrial Hydrology Program)
Amount: $597,185
Date: 04/07-03/10
Co-PI: Role - Principal Investigator. (Co-PI: Jackson, USDA)

Title: A Fine-Scale Soil Water Balance Modeling for AMSR-E Soil Moisture Calibration and Validation

Funded: NASA-JPL (Jet propulsion Lab)
Amount: $44,500
Date: 12/06-09/07
Co-PI: None

Title: Flow-Induced Redox Geochemistry within Fractured/ Macroporous and Layered Vadose Zone

Funded: NSF-Hydro (Hydrologic Sciences)
Amount: $476,726
Date: 05/07-04/11
Co-PI: Role - Principal Investigator. (Co-PI: McGuire, Geology and Geophysics)

Title: Multiscale Data Assimilation of Soil Moisture under Heterogeneous Soil Hydraulics

Funded: NSF-CMG (Collaborative Mathematical Sciences and Geosciences)
Amount: $340,792
Date: 09/06-09/09
Co-PI: Role - Principal Investigator. (Co-PI: Efendiev, Mathematics)

Title: Soil Hydrologic Properties for Simulation of Semi-Arid River Basin Water Balance – Phase II

Funded: LANL (Los Alamos National Laboratory)
Amount: $60,500
Date: 04/07-09/08
Co-PI: None.
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<tr>
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<td><strong>MOHANTY, BINAYAK</strong></td>
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<tr>
<td>Ph.D. Fellowship for Raghavendra Jana, “Use of Satellite Data for Soil Parameter Estimation in Rio Grande Basin”</td>
<td>NASA-ESS (Earth System Science)</td>
<td>$72,000</td>
<td>09/06-08/09</td>
<td>None</td>
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<td>Satellite Remote Sensing of Soil Moisture – Evolution of Statistics with Scale</td>
<td>NASA-THP (Terrestrial Hydrology Program)</td>
<td>$86,000</td>
<td>04/06-04/07</td>
<td>None</td>
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<td>Exploratory Analysis of Multi-Temporal Remote Sensing Data for Southern Great Plains</td>
<td>NASA-GAPP (GEWEX America’s Prediction Project)</td>
<td>$90,000</td>
<td>07/04-06/05</td>
<td>None</td>
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<td>Soil Hydrologic Properties for Simulation of Semi-Arid River Basin Water Balance</td>
<td>LANL (Los Alamos National Lab)</td>
<td>$100,000</td>
<td>11/04-10/06</td>
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<td>Ph.D. Fellowship for Sanjay Kumar Sharma, “Analysis and Assimilation of Soil Moisture from Ground, Air and Space-Borne Sensors”</td>
<td>NASA-ESS (Earth System Science)</td>
<td>$72,000</td>
<td>01/04-12/06</td>
<td>None</td>
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<td>Ecohydrology of Semiarid Woodlands: Role of Woody Plants in the Water Cycle</td>
<td>NSF-WCR (Water Cycle Research)</td>
<td>$500,000</td>
<td>05/03-04/06</td>
<td>Role - Co-Principal Investigator. (PI: Wilcox, Ecosystems Science and Management)</td>
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<tr>
<td>Development of High Density, High Performance Beowulf Cluster</td>
<td>NSF-MRI (Major Research Instrument)</td>
<td>$405,202</td>
<td>08/02-07/07</td>
<td>Role - Co-Principal Investigator. (PI: Rundell, Mathematics)</td>
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<td>Evolution of Multi-Scale Soil Hydrologic Processes and its Impact on Land-Atmosphere Interaction</td>
<td>NASA-GWEC (Global Water and Energy Cycle)</td>
<td>$300,000</td>
<td>01/02-12/04</td>
<td>Role - Principal Investigator. (Col-PI: Miller, Penn State)</td>
<td>Principal Investigator. (Col-PI: Miller, Penn State)</td>
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<td>Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA) - A NSF Science and Technology Center</td>
<td>NSF-SC (Science and Technology Center)</td>
<td>$16,491,268, (Responsible for $247,767)</td>
<td>10/99-09/04</td>
<td>Role - Co-Investigator. (PI: Sorooshian, University of Arizona)</td>
<td>Co-Investigator. (PI: Sorooshian, University of Arizona)</td>
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<td>Integrated Urban Flood Management in India: Technology-Driven Solutions</td>
<td>ITRA (Information Technology Research Academy, Govt. of India)</td>
<td>Indian Rs. 30 million (US $500,000)</td>
<td>10/13-09/16</td>
<td>Role – US Co-Investigator/Advisor. (PI: P.P. Mujumdar, IISc Bangalore)</td>
<td>Co-Investigator/Advisor. (PI: P.P. Mujumdar, IISc Bangalore)</td>
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<tr>
<td>Improving Groundwater Levels and Quality through Enhanced Water Use Efficiency in Eastern Indian Agriculture</td>
<td>ITRA (Information Technology Research Academy, Govt. of India)</td>
<td>Indian Rs. 30 million (US $500,000)</td>
<td>10/13-09/16</td>
<td>Role – US Co-Principal Investigator/Advisor. (PI: R.K. Panda, IIT Kharagpur/Bhubaneswar)</td>
<td>Co-Principal Investigator/Advisor. (PI: R.K. Panda, IIT Kharagpur/Bhubaneswar)</td>
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<td>Strategic Research Initiative: Numerical Porous Media (Focus: An Investigation of Scale Transitions with Hydrologic Interfaces: A Key Factor for Biogeochemistry Evolution in the Vadose Zone)</td>
<td>KAUST (King Abdullah University of Science and Technology)</td>
<td>US $4.5 million</td>
<td>05/12-05/15</td>
<td>Role – Co-Investigator. (PI: Efendiev, Mathematics)</td>
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<td>across Scales</td>
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<td>Exploratory Analysis of Multi-Temporal remote Sensing Data of</td>
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<td>Southern Great Plains</td>
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<td>Soil Hydrologic Properties for simulation of Semi-Arid River Basin</td>
<td>none</td>
<td>$105,000</td>
<td>Los Alamos National Lab</td>
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<td>Policy Change: A Cross-National Urban Perspective</td>
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<td>Ecohydrology of Semiarid woodlands: Role of Woody Plants in the</td>
<td>B. Wilcox, C. Munster, R. Jackson</td>
<td>$500,000</td>
<td>NSF/Water Cycle Research</td>
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<td>on Land-Atmosphere Interaction</td>
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<td>Sustainability of Semi-Arid Hydrology and Riparian Area (SAHRA) –</td>
<td>S. Sorooshian and others</td>
<td>$16,491,268</td>
<td>NSF/Science and Technology Center at University of Arizona</td>
<td>1999-2004</td>
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<td>A NSF Science and Technology Center (at University of Arizona)</td>
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<td>($responsible for $247,000)</td>
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**MOHANTY, BINAYAK**

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<thead>
<tr>
<th>Title</th>
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<tr>
<td>Space-Time Dynamics of Soil Moisture and Temperature Scale Issues</td>
<td>NASA/Land Surface Hydrology</td>
<td>$341,340</td>
<td>1999-2003</td>
<td>D. Miller</td>
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<td>Quantification of Flow in Fractured Rocks</td>
<td>DOE/USGS</td>
<td>$70,000</td>
<td>2000-2001</td>
<td>M. Th. van Genuchten</td>
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<td>Soil, Topography, and Vegetation Contribution to Soil Hydraulic and Thermal Properties</td>
<td>NASA/Mission to Planet Earth</td>
<td>$50,000</td>
<td>1997-1998</td>
<td>M. Th. van Genuchten</td>
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<td>Development of a Rainfall Simulator for the Assessment of Basic Hydrological Processes Affected by Brush Control</td>
<td>Texas Water Resources Institute</td>
<td>$18,000</td>
<td>2001-2002</td>
<td>C. Munster</td>
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<td>Analysis and Assimilation of Soil Moisture from Ground, Air, and Space-Borne Sensors</td>
<td>NASA/Graduate Fellowship</td>
<td>$72,000</td>
<td>2004-2006</td>
<td>Sanjay K. Sharma (Ph.D. student)</td>
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<td>Inter-Disciplinary Distinguished Lecture Series on “Water, Chemical, and Heat Transport in the Environmental Systems Across Different Space-Time”</td>
<td>VPR/Professional Development Grant</td>
<td>$11,000 (including matching from 4 participating depts)</td>
<td>2002-2003</td>
<td>R. Wurbs, A. Datta-Gupta, and H. Zhan</td>
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</table>
MOREIRA, ROSANA

Title: Improving safety of complex food items using electron beam technology
Funded: USDA/CSREES
Amount: $1,061,739
Date: 2002-2006
Co-PI: M.E. Castell-Perez

Title: A powerful new approach to improve electron beam treatment of complex food items
Funded: USDA/NRI
Amount: $270,000
Date: 2002-2005
Co-PI: M.E. Castell-Perez

Title: Research in Food Dehydration
Funded: Frito-Lay, Inc.
Amount: $40,000
Date: 2003-Present
PI: none

Title: Low Dose Irradiation Effects on Quality and Shelf-Life of Selected Tropical Fruits
Funded: SureBeam Inc.
Amount: $25,000
Date: 2003
Co-PI: M.E. Castell-Perez

Title: Development of cell and nanoparticle based sensors for BSE
Funded: FDA/NIH
Amount: $196,713
Date: 2001-2003
Co-PI: Theresa Good

Title: Beam delivery strategy for treatment of irregularly shaped products.
Funded: ARP/Texas Board of Higher Education
Amount: $120,000
Date: 1999-2001
Co-PI: M.E. Castell-Perez

Title: Determination of masa properties as related to oil absorption during frying
Funded: Frito-Lay, Inc.
Amount: $13,500
Date: 1990
Co-PI: none

Title: Enhancing the Quality of Guar Gels for Oil Production - A Feasibility Study
Funded: Halliburton Energy Services
Amount: $70,571
Date: 1997
Co-PI: Vince Sweat

Title: Improved Oil Production using Economical Biopolymer Surfactant Blends for Profile Modification and Mobility Control.
Funded: DOE
Amount: $50,000
Date: 1996-1998
Co-PI: Maria A. Barrufet
**MOREIRA, ROSANA**

Title: Biopolymer Technology  
Funded: Chemstar  
Amount: $10,000  
Date: 1996  
Co-PI: Maria A. Barrufet

Title: Use of High Hydrostatic Pressure to Produce Safe and Long-Lasting Fresh Pork Sausage  
Funded: National Pork Producers Council  
Amount: $17,000  
Date: 1996  
Co-PI: Elsa Murano

Title: Commercialization of a New Control Technology for a High Quality Food Extrusion System  
Funded: ATPD/ Texas Board of Higher Education  
Amount: $318,397  
Date: 1993-1995  
PI: M. Nikolau

Title: A New Control Technology for a High Quality Food Extruder. Advanced Technology Program  
Funded: ATP/ Texas Board of Higher Education  
Amount: $208,000  
Date: 1991-1993  
Co-PI: D. Whitaker
MUKHTAR, SAQIB

Title: National Facilitation of Extension Programming in Climate Change Mitigation and Adaptation for Animal Agriculture.
Funded: USDA-NIFA (Subcontract with Univ. of Nebraska)
Amount: $4,290,000
Date: 2011-2016
Co-PI: I am the PI for AgriLife Research

Title: Research, Education and Extension Program for Sustainable Manure Management Practices-
Learning from the Belgian Model
Funded: USDA-CSREES
Amount: $149,999
Date: 2009-2013
Co-PI: I am the Co-PI

Title: Evaluation of Electrostatic Particle Ionization and Biocurtain© Technologies to Reduce Dust,
Odor and other Pollutants from Broiler Houses.
Funded: Texas State Soil & Water Conservation Board
Amount: $169,624
Date: 2010-2012
Co-PI: I am the PI
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<tr>
<th>Co-PI:</th>
<th>A Field-Scale Aeration System To Control Odor From Open Liquid Manure Storage Facilities</th>
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<td>Title:</td>
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<td>Funded:</td>
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<td>Amount:</td>
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<td>Date:</td>
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<td>PI:</td>
<td>Renewable Energy and Environmental Sustainability Using Biomass From Dairy And Beef Animal Production</td>
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<td>Date:</td>
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<td>Best Particles And Guidelines For Contaminated Plant and Animal Disposal</td>
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<td>Strategies for Management and Subsequent Reduced Surface Water Phosphorus Runoff from Dairies in the North Bosque and Leon Watersheds</td>
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<td>Title:</td>
<td>USDA-CSREES National Integrated Water Quality Program</td>
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<td>$582,478</td>
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<td>Date:</td>
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<td>Co-PI:</td>
<td>Phytoremediation of Excessively High Phosphorus Soils and Subsequent Reduced Phosphorus Runoff into the North Bosque River</td>
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<td>Title:</td>
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<td>Funded:</td>
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<td>I am the Co-PI.</td>
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<td>Development of On-line Nutrient Management Certification Course for Technical Service Providers for CAFOs</td>
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<td>Title:</td>
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<td>Demonstration and Transfer of Selected New Technologies for Animal Waste Pollution Control</td>
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<td>Carcass Disposal Working Group Project. Subcontract of the National Agricultural Biosecurity Center Consortium</td>
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Demonstration of Real-Time Monitoring Systems to Increase the Intensity of Lagoon Management and to Reduce Water Pollution From Overflows and Illegal Discharges
Texas Water Resource Institute (TWRI)
$10,000
2003
I am the PI.
MUKHTAR, SAQIB

Title: A Novel Approach of Feedlot Manure as Reburn Fuel for NOx Reduction in Existing Coal Fired Plants
Funded: National Center for Manure and Animal Waste Management, NCSU
Amount: $34,000
Date: 2003-2004
Co-PI: I am the Co-PI.

Title: Examination of Estrogenic Chemical Behavior for Determining Potential Off-Field Migration from Dairy Manure to Texas Water
Funded: Texas Water Resource Institute (TWRI)
Amount: $10,000
Date: 2003
Co-PI: I am the Co-PI.

Title: Marketing Composted Manure To Public Entities
Funded: Texas Commission on Environmental Quality (TCEQ)
Amount: $824,094
Date: 2002-2005
PI: I am the Co-PI.

Title: Air Quality: Odor, dust, and gaseous emissions from concentrated animal feeding operations in the southern Great Plains
Funded: USDA-CSREES
Amount: $3,000,000
Date: 2002-2007
Co-PI: I am the Co-PI.

Title: Co-firing Coal: Feedlot and Litter Biomass Fuels Pulverized in a Fuel and Fixed Bed Burner
Funded: USDOE
Amount: $149,965
Date: 2000-2002
Co-PI: I am the Co-PI.

Title: Odor Abatement and Emission Inventories from Agricultural Operations
Funded: Agricultural Air Quality Legislative Initiative
Amount: $700,000
Date: 1999-2003
Co-PI: I am the Co-PI.

Title: Odors and Arsenic Emissions From Poultry Growing Operations
Funded: TCEQ
Amount: $100,000
Date: 1999-2000
Co-PI: I am the Co-PI.

Title: Developing a Risk-Based Approach to Watershed Level, Non Point Source Modeling of Fecal Coliform Pollution for Total Maximum Daily Load Estimates
Funded: Texas Water Resource Institute (TWRI)
Amount: $25,000
Date: 1999-2000
Co-PI: I am the Co-PI.
MUNSTER, CLYDE

Title: Sustainable Feedstock Production for Bioenergy
Duration: 1/1/13 – 12/31/14
Sponsor: South Central Sun Grant Agency
Sponsor Funding: $162,000
Support Personnel: Lead PI, Clyde Munster, co-PIs, Tony Provin, Kevin McInnes, Hailin Zhang

Title: SEC Travel Grant
Duration: 1/01/13 - 8/31/13
Sponsor: Texas A&M University
Sponsor Funding: $2,500
Support Personnel: Lead PI, Clyde Munster

Title: Nueces River Arundo Study
Duration: 6/01/13 - 12/31/14
Sponsor: Nueces River Authority
Sponsor Funding: $6,000
Support Personnel: Lead PI, Clyde Munster

Title: Assessment of E. Coli pollution from failing OSSFs to Galveston Bay
Duration: 10/1/12 – 3/31/14
Sponsor: Texas General Land Office – Coastal Management Plan
Sponsor Funding: $99,710
Support Personnel: Lead PI, Clyde Munster, co-PIs, John Jacob, Karthi Karthikeyan

Title: EM Study at the Research Farm Well Field Site
Duration: 9/1/12 – 7/31/13
Sponsor: Baker Hughes
Sponsor Funding: $45,000
Support Personnel: Lead PI, Clyde Munster, co-PI, Mark Everett

Title: Development of refinery-grade bio-oil with consistent properties using blended feedstocks
Duration: 2011-2013
Sponsor: Texas AgriLife Research Bioenergy Initiatives
Sponsor Funding: $200,000
Support Personnel: Lead PI, Sergio Capareda, co-PIs, Clyde Munster, Sandun Fernando, Tony Provin and Marco Palma.

Title: Drought Decision Making Tool for Agricultural Producers
Duration: 2010-2014
Sponsor: USDA – NIFA
Sponsor Funding: $498,649
Support Personnel: PI, C. Munster, co-PIs, T. Cothren and R. Schumacher

Title: S-STEM: WATer Engineering Research Scholars (WATER Scholars)
Duration: 2010-2015
Sponsor: National Science Foundation
Sponsor Funding: $597,978
Support Personnel: PI, Robin Autenrieth, co-PIs, C. Munster, B. Mohanty, and J. Pettibon

Title: Best Management Practices (BMP) Assessment Using Rainfall Simulation – Ft. Hood, TX
Duration: 2010-2013
Sponsor: USDA – NRCS
Sponsor Funding: $299,700
Support Personnel: PI, B. Fox, co-PIs, C. Munster, B. Wilcox, and B. Harris

Title: Enhancing the Quality of Marketable Products Derived from Mobile Fast Pyrolysis of Lignocellulosic Biomass
Duration: 2009-2011
Sponsor: Texas AgriLife Research Bioenergy Initiatives
Sponsor Funding: $350,000
Support Personnel: Lead PI, Sergio Capareda, co-PIs, Clyde Munster, Sandun Fernando, Don Vietor, Tony Provin and Marco Palma.
### Grants

<table>
<thead>
<tr>
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<th>Duration</th>
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<th>Sponsor Funding</th>
<th>Support Personnel</th>
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<tr>
<td>Hydrologic Modeling of the Ganspoel Catchment in Belgium</td>
<td>2009-2010</td>
<td>TAMU International Research Travel Assistance Grant Program</td>
<td>$1,000</td>
<td>PI, Clyde Munster</td>
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<td>Research, Education and Extension Program for Sustainable Manure Management Practices, Learning from the Belgian Model</td>
<td>2009-2012</td>
<td>USDA-CSREES</td>
<td>$150,000</td>
<td>Lead PI, C. Munster, co-PIs, C. Engler and S. Mukhtar</td>
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<td>Optimizing the Logistics of a Mobile Fast Pyrolysis System for Sustainable Bio-Crude Oil Production</td>
<td>2009-2011</td>
<td>DOE North Central Sun Grant Program</td>
<td>$700,000</td>
<td>Lead PI, S. Capareda, co-PIs, C. Munster, D. Vietor, T. Provin and M. Palma</td>
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<tr>
<td>Shelf Life and Tensile Strength of Tifway Bermudagrass Sod Amended with Composted Municipal Biosolids.</td>
<td>1/1/08 – 12/31/08</td>
<td>Texas Turfgrass Research and Extension Endowment</td>
<td>$5005</td>
<td>Lead PI, Dr. Vietor, co-PIs, R. White, D. Chalmers, T. Provin, M. Tahboub</td>
</tr>
<tr>
<td>Preparing Underrepresented Scholars for Challenges in Bioenergy Systems Engineering and Sustainability – A Research and Leadership PhD Program.</td>
<td>2008-2013</td>
<td>USDA CSREES National Needs Fellowship Program</td>
<td>$234,000</td>
<td>Lead PI, S. Capareda, co-PIs, S. Fernando, C. Munster, T. Provin, and M. Pena.</td>
</tr>
<tr>
<td>Managing to limit runoff and drainage losses of nutrients during cycling of composted biosolids through turfgrass sod.</td>
<td>2008-2009</td>
<td>The Lawn Institute, Turfgrass Producers International</td>
<td>$5,000</td>
<td>Lead PI, R.H. White, co-PIs, C.L. Munster, T.L. Provin, and R.W. Schnell.</td>
</tr>
<tr>
<td>Mobile Fluidized-bed Pyrolysis System.</td>
<td>2008-2009</td>
<td>Texas AgriLife Research.</td>
<td>$70,000</td>
<td>Lead PI, S. Capareda, co-PIs, S. Fernando, C. Munster, D. Vietor, T. Provin, and Y. Deng.</td>
</tr>
<tr>
<td>Environmentally sustainable agriculture for food bio-security – A Research and Leadership PhD Program.</td>
<td>2007-2013</td>
<td>USDA CSREES National Needs Fellowship Program</td>
<td>$230,000</td>
<td>Lead PI, Y. Huang, co-Pis, C. Munster, P. Smith, S. Mukhtar, M. Pina, R. Karthikeyan</td>
</tr>
<tr>
<td>Preparing underrepresented scholars for research careers in biological and agricultural engineering and veterinary medicine.</td>
<td>2007-2012</td>
<td>USDA CSREES</td>
<td>$164,000</td>
<td>Lead PI, P. H. Smith, co-PIs, C.L. Munster, M. Pina, V. Singh.</td>
</tr>
</tbody>
</table>
MUNSTER, CLYDE

Title: Chemically treated composted biosolids enhance water conservation and quality on urban landscapes
Duration: 3/2/07 – 2/29/08
Sponsor: TWRI-USGS
Sponsor Funding: $5,000
Support Personnel: Lead PI, Dr. Don Vietor, co-PIs, Dr. White

Title: Cycling of geotube residue from dairy lagoons through turfgrass sod
Duration: 3/07 – 2/08
Sponsor: U.S. EPA
Sponsor Funding: $6,500
Support Personnel: Lead PI, Dr. Don Vietor, co-PIs, Dr. Provin

Title: Development, demonstration, evaluation and transfer of an innovative practice for exporting manure nutrients through turfgrass sod.
Duration: 9/1/06 – 8/31/07
Sponsor: USDA-NRCS
Sponsor Funding: $74,994
Support Personnel: Lead PI, Dr. Don Vietor, co-PIs, Dr. White and Dr. Provin
<table>
<thead>
<tr>
<th>Title</th>
<th>Funded</th>
<th>Amount</th>
<th>Date</th>
<th>Co-PI</th>
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<tbody>
<tr>
<td>Hillslope scale rainfall simulator for understanding shrub and water</td>
<td>Skeen Institute</td>
<td>$44,376</td>
<td>2005-2007</td>
<td>Lead PI, Dr. Brad Wilcox (RLEM), Co-PIs, Dr. Keith Owens (RLEM-Uvalde)</td>
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<tr>
<td>interactions</td>
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<tr>
<td>Augmentation groundwater recharge through brush control: a feasibility</td>
<td>Edwards Aquifer Authority</td>
<td>$300,000</td>
<td>2003-2007</td>
<td>Lead PI, Dr. Brad Wilcox (RLEM), Co-PIs, Dr. Calvin Alexander (U. of MN), Dr. George Veni (Consultant)</td>
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<tr>
<td>Texas Water Resource Institute</td>
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<tr>
<td>Development of smoke tracer equipment</td>
<td></td>
<td>$4,950</td>
<td>2004-2005</td>
<td>Philip Taucer (BAEN graduate student)</td>
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<tr>
<td>Means to environmental considerations: assisting TCFA evaluation of</td>
<td>Texas Cattle Feeders Association</td>
<td>$9,289</td>
<td>2003-2004</td>
<td>Lead PI, Dr. Don Vietor (AGRO)</td>
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<tr>
<td>manure management</td>
<td></td>
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<tr>
<td>Ecohydrology of Semiarid Woodlands: Role of Woody Plants in the Water</td>
<td>National Science Foundation (NSF)</td>
<td>$331,396</td>
<td>2003-2006</td>
<td>Lead PI, Dr. Wilcox (RLEM), Co-PIs, Dr. Mohanty (BAEN), Dr. Owens (Uvalde Experiment Station), Dr. Stern (UT-Austin), Dr. Banner (UT-Austin), and Dr. Jackson (Duke)</td>
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<tr>
<td>Cycle</td>
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<td>Response of Stream and Riparian Biota of the Edwards Aquifer Recharge</td>
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<td>Zone to Variation in Landscape</td>
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<td>San Antonio Water System</td>
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<tr>
<td>Influence of shrubs on runoff pathways on the Honey Creek Watershed</td>
<td></td>
<td>$125,000</td>
<td>2002-2006</td>
<td>Lead PI, Dr. Wilcox (RLEM)</td>
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<tr>
<td>Texas Water Resource Institute</td>
<td></td>
<td>$4,950</td>
<td>2003</td>
<td>Shane Porter (BAEN graduate student)</td>
</tr>
<tr>
<td>Measuring infiltration using a rainfall simulator to compare shrub</td>
<td></td>
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<td>and water interactions of brush species</td>
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<tr>
<td>Texas Water Resource Institute</td>
<td></td>
<td>$3,995</td>
<td>2003</td>
<td>Jason Afinowicz (BAEN graduate student)</td>
</tr>
<tr>
<td>Determining a method for targeting brush control through remote</td>
<td></td>
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<td>sensing, GIS and hydrologic modeling</td>
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<tr>
<td>Texas A&amp;M University, International Programs</td>
<td></td>
<td>$675</td>
<td>2003-2004</td>
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<tr>
<td>Hydrologic modeling of international watersheds</td>
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### MUNSTER, CLYDE

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Sustainability of Systems for Manure Export and Water Quality Improvements on Impaired Watersheds</td>
<td>The Higher Education Coordinating Board Advanced Technology Program (ATP)</td>
<td>$191,401</td>
<td>2002-2003</td>
<td>Lead PI, Dr. Vietor (AGRO), Co-PIs, Dr. White (AGRO) and Dr. Anne McFarland (Tarleton State University)</td>
</tr>
<tr>
<td>Evaluation of Shrub Encroachment on Water Availability in Semi-arid Rangeland of the Southwestern U.S.</td>
<td>NASA</td>
<td>$44,000</td>
<td>2002-2003</td>
<td>Dr. Brad Wilcox</td>
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<tr>
<td>Integrating Management of Feedyards and Grassland during TMDL Development and Implementation</td>
<td>Texas Cattle Feeders Association</td>
<td>$10,910</td>
<td>2002-2004</td>
<td>Lead PI, Dr. Don Vietor (AGRO), Co-PIs, Dr. Provin (AGRO)</td>
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<tr>
<td>Assessing Water Quality Impacts of Nutrient Imports into an Urban Gradient</td>
<td>Department of Interior, USGS</td>
<td>$140,000</td>
<td>2001-2003</td>
<td>Dr. Vietor (AGRO), Dr. White (AGRO), and Dr. Provin (AGRO)</td>
</tr>
<tr>
<td>Achieving TMDL Goals in Impaired Watersheds Through Manure Export in Turfgrass Sod.</td>
<td>USDA-CSREES</td>
<td>$384,000</td>
<td>2001-2004</td>
<td>Dr. Vietor (AGRO), Dr. White (AGRO), and Dr. Provin (AGRO)</td>
</tr>
<tr>
<td>Development of a Rainfall Simulator for the Assessment of Basic Hydrologic Processes Affected by Brush Control</td>
<td>The Texas Water Resouce Institute (TWRI)</td>
<td>$18,000</td>
<td>2001-2002</td>
<td>Dr. Wilcox (RLEM), Dr. Mohanty (BAEN), and Dr. Owens (Uvalde Experiment Station)</td>
</tr>
<tr>
<td>Modeling research at Leuven Katholieke Universiteit in Leuven, Belgium</td>
<td>Fulbright Scholar Program</td>
<td>$10,000</td>
<td>2000</td>
<td>None</td>
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<tr>
<td>Modeling research at Leuven Katholieke Universiteit in Leuven, Belgium</td>
<td>Katholieke Universiteit Leuven</td>
<td>$4,000</td>
<td>2000</td>
<td>None</td>
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<tr>
<td>Phytoremediation and bioremediation of land contaminated by PAHs, PCBs and TNT</td>
<td>Gulf Coast Hazardous Substance Research Center</td>
<td>$38,890</td>
<td>2000-2001</td>
<td>Dr. Malcom Drew (HORT), Dr. Yavuz Corapcioglu (CVEN)</td>
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<tr>
<td>Phytoremediation and bioremediation of land contaminated by PAHs, PCBs and TNT</td>
<td>Gulf Coast Hazardous Substance Research Center</td>
<td>$62,334</td>
<td>1999-2000</td>
<td>Dr. Malcom Drew (HORT), Dr. Yavuz Corapcioglu (CVEN)</td>
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MUNSTER, CLYDE

Title: System for conserving and adding value to manure sources of nutrients in turfgrass sod
Funded: Southern Region Sustainable Agriculture Research and Education (SARE)
Amount: $75,000
Date: 1999-2003
Co-PI: Dr. Don Vietor (AGRO), Dr. Richard White (AGRO)

Title: Model simulation of global warming impacts on production agriculture
Funded: TAMU Office of International Coordination
Amount: $1,000
Date: 1999
Co-PI: None

Title: Phytoremediation and bioremediation of land contaminated by PAHs, PCBs and TNT
Funded: Gulf Coast Hazardous Substance Research Center
Amount: $60,428
Date: 1998-1999
PI: Dr. Malcom Drew (HORT), Dr. Yavuz Corapcioğlu (CVEN)
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<th>Title</th>
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<tr>
<td>Development of an Integrated Eukaryotic Algae Platform</td>
<td>NSF-CBET</td>
<td>$225,000</td>
<td>Aug. 1, 2012 - July 31, 2015</td>
<td>None</td>
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<tr>
<td>Germ protein extraction and fractionation</td>
<td>QTI, Intl, Inc.</td>
<td>$53,000</td>
<td>Jan. 9, 2009 – Dec 31, 2011</td>
<td>None</td>
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<tr>
<td>NAABB (Alage Biofuels Consortia)</td>
<td>Danford Plant Science Center</td>
<td>$193,000</td>
<td>April 1, 2010 – March 31, 2012</td>
<td>Ron Lacey</td>
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<td>Ethanol from agriculture for Arkansas and America.</td>
<td>DOE – ASU subcontract</td>
<td>$441,500</td>
<td>August 1, 2008-Dec. 31, 2011</td>
<td>None</td>
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<tr>
<td>Development and Evaluation of Downstream Processing of Sugarcane</td>
<td>Growers Research Group, LLC.</td>
<td>$615,000</td>
<td>Sept. 1, 2005- May 2010</td>
<td>None</td>
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<tr>
<td>Identification and Reduction of Phenolics and Proteases in <em>Lemna minor</em></td>
<td>Biolex Therapeutics Inc.</td>
<td>$249,000</td>
<td>Oct. 1, 2005 – Nov. 30, 2007</td>
<td>None</td>
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<tr>
<td>Plant Bioprocessing</td>
<td>Biolex Therapeutics Inc.,</td>
<td>$25,000</td>
<td>July-Aug. 2005</td>
<td>None</td>
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<td>Purification of Human MAb from Egg White;</td>
<td>Origen Therapeutics</td>
<td>$163,000</td>
<td>Sept. 2003 - April 2005</td>
<td>Scot McKenzie</td>
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<tr>
<td>Fermentation and Purification of a Recombinant Sweet Protein</td>
<td>ProdiGene Inc.</td>
<td>$100,500</td>
<td>8/1/98 - 4/1/00</td>
<td>None</td>
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<tr>
<td>Title:</td>
<td>Recovery of Recombinant Proteins from Transgenic Soybeans</td>
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<td>Amount:</td>
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<td>Date:</td>
<td>9/1/95 - 8/31/98</td>
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<tr>
<td>CO-P1:</td>
<td>C. E. Glatz, L. A. Johnson, and J. Howard</td>
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<thead>
<tr>
<th>Title:</th>
<th>Recovery of Recombinant Proteins from Transgenic Crops</th>
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<tr>
<td>Funded:</td>
<td>ProdiGene Inc.</td>
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<tr>
<td>Amount:</td>
<td>$52,500</td>
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<td>Date:</td>
<td>4/1/97 - 1/1/98</td>
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<tr>
<th>Title:</th>
<th>Adaptation of Traditional Food Processing to Recovery of Recombinant Protein from Plants</th>
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<tr>
<td>Funded:</td>
<td>Iowa Biotechnology Byproducts Consortium</td>
</tr>
<tr>
<td>Amount:</td>
<td>$19,900</td>
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<tr>
<td>Date:</td>
<td>5/1/97-4/30/98</td>
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<tr>
<td>CO-P1:</td>
<td>Glatz, C. E.</td>
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<tr>
<th>Title:</th>
<th>Development of a Low-Cost Germ Recovery Process for High-Oil Corn. DuPont Agricultural Products</th>
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<td>Amount:</td>
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<td>Co-P1:</td>
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<tr>
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<tr>
<td>Amount:</td>
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<tr>
<td>Date:</td>
<td>1/1/98- 12/31/99</td>
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<td>CO-P1:</td>
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<tr>
<td>Enzymatic and Regiospecific Acylation of Monosaccharides and Maltooligosaccharides</td>
<td>Grain Processing Company</td>
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<tr>
<td>Process Design and Economic Analysis of Biologically Produced Surfactants from Corn.</td>
<td>Iowa Corn Promotion Board</td>
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<tr>
<td>Recovery of Recombinant Proteins from Transgenic Crop Species</td>
<td>Pioneer Hi-Bred Intl</td>
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<tr>
<td>Development and Evaluation of Downstream Processing for Purification of Recombinant Proteins from Transgenic Sugarcane</td>
<td>Growers Research Group, LLC.</td>
</tr>
<tr>
<td>Identification and Reduction of Phenolics and Proteases in Lemna minor</td>
<td>Biolex Therapeutics Inc.</td>
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<tr>
<td>Plant Bioprocessing</td>
<td>Biolex Therapeutics Inc.</td>
</tr>
<tr>
<td>Purification of Human MAb from Egg White</td>
<td>NIH-SBIR contract</td>
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<tr>
<td>Recovery of Recombinant Proteins from Transgenic Crops</td>
<td>ProdiGene Inc.</td>
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NIKOLOV, ZIVKO

Title: Adaptation of Traditional Food Processing to Recovery of Recombinant Protein from Plants
Funded: Iowa Biotechnology Byproducts Consortium
Amount: $19,900
Date: 5/1/97-4/30/98
Co-PI: Glatz, C. E.

Title: Development of a Low-Cost Germ Recovery Process for High-Oil Corn.
Funded: DuPont Agricultural Products
Amount: $24,000
Date: 10/97-3/98
Co-PI: Nikolov, Z. L.

Title: Recovery of Recombinant Proteins from Transgenic Crops
Funded: ProdiGene Inc
Amount: $134,500
Date: 1/1/98- 12/31/99
PI: None

Title: Fermentation and Purification of a Recombinant Sweet Protein
Funded: ProdiGene Inc.
Amount: $100,500
Date: 8/1/98 - 4/1/00
Co-PI: None
Title: Emission Rates, Concentrations, and Factors for emissions of Ammonia, Hydrogen Sulfide and PM from free-stall and open-lot Dairies
Funded: USDA/CSREES
Amount: $200,000
Date: 2004-2006 (This is the last year.)
Co-PI: Drs. Capareda, Shaw, Mukhtar, and Lacey

Title: Air Quality: Odor, Dust, and Gaseous Emissions from Concentrated Feeding Operations in the Southern High Plains.
Funded: USDA/CSREES
Amount: $140,000 – $250,000 per year
Date: 2002-2006
Co-PI: Drs. Capareda, Shaw, Mukhtar, and Lacey

Title: A Science-Based Emission Factor for 6-Row Cotton Pickers
Funded: John Deere ($50,000 per year); Cotton Foundation ($16,000 per year) and Cotton Incorporated ($16,000 per year.)
Amount: $200,000 per year initially; $80,000 per year, currently
Date: 2006-2008
PI: Drs. Capareda and Shaw

Title: PM10 Emission Factors from Almond Harvest Operations.
Funded: California Almond Board
Amount: $80,000
Date: 2004-2006
Co-PI: Drs. Capareda and Shaw

Title: Air Pollution Regulatory Impacts on Agricultural Operations
Funded: Texas Legislative Initiative,
Amount: $200,000 per year initially; $80,000 per year, currently
Date: 1999-Present
Co-PI: Drs. Capareda, Shaw, Mukhtar, and Lacey

Title: Performance Evaluation of Federal Reference Method PM2.5 Sampler
Funded: Cotton Foundation
Amount: $11,000 per year (2006)
Date: 1996-present
Co-PI: Dr Shaw

Title: Dispersion Modeling
Funded: Cotton Foundation
Amount: $11,000 per year
Date: 1994-2006
Co-PI: Dr Shaw

Title: Agricultural Air Quality Fine Particle Project: Task 1 Livestock – Feedlot PM Emission Factors and Emissions Inventory Estimates; Task 2 Tilling, Harvesting, and Loading Emission Factors and Emissions Inventory Estimates; Task 3 Prescribed Burning Emission Factors and Emissions Inventory Estimates
Funded: Natural Resource Conservation Commission (TNRCC)
Amount: $100,000
Date: 1998-1999
Co-PI: Drs Shaw and Auvermann

Title: Emission Factors from Grain Handling Facilities
Funded: Texas Cattle Feeders Association and National Cattlemen’s Beef Association
Amount: $80,000
Date: 1995 – 1996
Co-PI: Dr Shaw

Title: Cyclone Design for Axial-Flow Fan Exhaust Systems
Funded: Cotton Foundation
Amount: $40,000
Date: 1994-1996
PARNELL, CALVIN

Title: Engineering/Economic Analyses for Cotton Gin Compliance with Air Pollution Regulation  
Funded: Texas Cotton Ginners, Texas State Support Funds and Cotton Foundation  
Amount: $40,000  
Date: 1994-2000  
Co-PI: Dr. Shaw

Title: Dispersion Modeling of SO2  
Funded: Advanced Technology Program  
Amount: ($198,000; $35,000 for BAEN)  
Date: 1991-93  
Co-PI: Dr. W. Green - Animal Science Department

Title: Cyclone Design  
Funded: Cotton Foundation  
Amount: $25,000  
Date: 1982-83  
PI: None

Title: Recombination and Recirculation of grain Dust at Export Elevators  
Funded: USDA FGIS  
Amount: $100,000  
Date: 1990-91  
Co-PI: None

Title: Feed Delivery System  
Funded: Cactus Feeders  
Amount: $26,000  
Date: 1987  
Co-PI: None

Title: Temperature and Humidity Control/Cotton Classing  
Funded: USDA, AMS 1984  
Amount: $37,000  
Date: 1984  
Co-PI: None

Title: Biomass Conversion  
Funded: Cotton Foundation  
Amount: $60,000  
Date: 1984-90  
Co-PI: Dr. LePori

Title: COMAX/GOSSYM  
Funded: Cotton Foundation  
Amount: $60,000  
Date: 1986-88  
Co-PI: None

Title: Grain Dust Explosions  
Funded: General Mills, 1981  
Amount: $10,000  
Date: 1981  
Co-PI: None

Title: Utilization Alternatives for Cotton Gin Trash  
Funded: NSF  
Amount: $230,000  
Date: 1976-81  
Co-PI: Dr. Reddell
PORTER, DANA

Title: Irrigation Water Management for Southern Region Soybean
Funded: United Soybean Board
Amount: $461,270
Date: 2014-2015
Co-PI: Jason Krutz is PI; Co-PIs are Chris Henry, Joe Henggeler, Dana Porter, Brian Leib, Lyle Pringle, Ron Levy, Dharmendra Saraswat, Trent Irby, Stacia Davis, Jeremy Ross, Brad Watkins, Larry Falconer

Title: Crop Performance and Water Use Efficiency Assessment Using Three Irrigation System Methods
Funded: The Buffett Foundation
Amount: $125,846
Date: 2014
Co-PI: Thomas Marek

Title: Estimating economic return of transgenic insect protection in corn based on yield potential, benefits from insect control, and input costs under different degrees of water availability
Funded: Texas Corn Producers Board
Amount: $9,500
Date: 2014
Co-PI: Mike Brewer is PI; Mac Young and Dana Porter are co-PIs.

Title: Timely management of limited irrigated crops in Texas using an empirically-based model and innovative information dashboard technology.
Funded: Texas A&M AgriLife Research, Texas A&M Engineering Experiment Station and Texas A&M AgriLife Extension Service Research, Engineering and Extension: Creation and Deployment of Water-Use Efficient Technology Platforms.
Amount: $143,492
Date: 2014
Co-PI: Jim Bordovsky is PI; Co-PIs are Jim Wall, Dana Porter and Keith Biggers.

Title: Educating Stakeholders in Agricultural Management Issues, Technologies and BMPs
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $32,200
Date: 2013-2015
Co-PI: Bridget Guerrero, Thomas Marek and Dan Rogers

Title: Higher Integration Networking, Texas High Plains Evapotranspiration Network.
Funded: Texas Water Development Board via Panhandle Regional Planning Commission
Amount: $180,000
Date: 2012-2014
Co-PI: Thomas Marek

Title: Agricultural Water Management Online Course Development.
Funded: USDA-ARS Ogallala Aquifer Program.
Amount: $65,550
Date: 2012-2014
Co-PI: Dan Rogers

Title: Development of Bushland Evapotranspiration System (BETS)
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $40,900
Date: 2011-2013
Co-PI: Prasanna Gowda was PI; Co-PIs were T.A. Howell, P.D. Colaizzi, T.H. Marek, D.O. Porter, and P.V. Vara Prasad

Title: Evapotranspiration and Energy Balance of Irrigated and Dryland Sunflower/Cotton.
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $50,000
Date: 2011-2013
Co-PI: Terry Howell was PI; Co-PIs were Steve Evett, Judy Tolk, Paul Colaizzi, Prasanna Gowda, Freddie Lamm, Rob Aiken, Paxton Payton, Lal Almas, Thomas Marek, Dana Porter, Nich Kenny
PORTER,dana

Title: Evaluating Alternative Meteorological Data Sources for Potential Use in Irrigation Management
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $38,880
Date: 2011-2013
Co-PI: Thomas Marek, Prasanna Gowda, Dan Rogers, Nicholas Kenny, and Terry Howell

Title: Spatial Interpolation of Daily Evapotranspiration Data in the Texas High Plains
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $29,000
Date: 2011-2013
Co-PI: Thomas Marek was PI; Co-PIs were Dana O. Porter, Prasanna H. Gowda, Terry A. Howell, Paul D. Colaizzi

Title: TXHPET network data support for OAP projects
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $29,129
Date: 2011-2013
Co-PI: Thomas Marek was PI; Co-PIs were Dana Porter, Jed Moorhead, Don Dusek, Terry Howell, Prasanna Gowda, Nicholas Kenny, and Paul Colaizzi

Title: Development of “Viral”, Web-based Water Use Educational Video Content
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $21,500
Date: 2010-2013
Co-PI: Nich Kenny was PI; Co-PIs were Dana Porter, Danny Rogers, Paul Colaizzi, Pat Porter, and Terry Howell

Title: Rainwater/Stormwater Harvesting and Small-Acreage/Urban Irrigation Education Site
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $38,600
Date: 2011-2013
Co-PI: Nich Kenny was PI; Co-PIs were Thomas Marek, Dana Porter, Billy Kniffen and J.D. Ragland

Title: Conversion of Crop Water Allocator (CWA) and Crop Yield Predictor (CYP) for Web-Based Delivery in Kansas and Texas
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $62,180
Date: 2010-2013
Co-PI: Norm Klocke was PI; Co-PIs were Nich Kenny, Loyd Stone, Dana Porter, Dan Rogers

Title: Youth Education on Rainwater Harvesting and Agricultural Irrigation Training for Small Acreage Land Owners
Funded: Texas Water Development Board
Amount: $65,919
Date: 2010-2012
Co-PI: Justin Mechell

Title: Promoting Adoption of Efficient Irrigation Practices through Continuing Education
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $33,270
Date: 2009-2011
Co-PI: Danny Rogers

Title: Educational Enhancements to the Texas High Plains Evapotranspiration (ET) Network
Funded: Texas Water Development Board
Amount: $99,075
Date: 2009-2011
Co-PI: Thomas Marek was PI; Dana Porter and Nich Kenny were co-PIs.
PORTER, DANAL

Title: Adaptation of Crop Water Allocator and Crop Yield Predictor modeling tools to the Texas High Plains
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $31,250
Date: 2009-2010
Co-PI: Nick Kenny was PI; co-PIs were Dana Porter, Norman Klocke, Loyd Stone, and Paul Colaizzi

Title: Assessment of Texas Evapotranspiration (ET) Networks
Funded: Texas Water Development Board
Amount: $198,835
Date: 2009 - 2011
Co-PI: Thomas Marek

Title: Qualifying Fetch Effects and Meteorological Station Site Conditions for ET Computations
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $49,000
Date: 2008 - 2010
Co-PI: Thomas Marek was PI; co-PIs were Terry Howell, Prasanna Gowda, and Dana Porter

Title: Regional Educational Efforts for Subsurface Drip Irrigation (SDI).
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $40,000
Date: 2008 - 2010
Co-PI: Freddie Lamm was PI; Dana Porter was Co-PI.

Title: Educational video and slide show content addition to Ogallala Aquifer Program and TXHPET web sites
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $ 21,500
Date: 2009 - 2010
Co-PI: Nick Kenny was PI; Co-PIs were Dana Porter, Thomas Marek and Terry Howell

Title: Training, user feedback, testing, economic impact and revisions of the Crop Water Allocator and Crop Yield Predictor models
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $64,500
Date: 2009 - 2010
Co-PI: Norm Klocke was PI; co-PIs were Danny Rogers, Troy Dumler, Nich Kenny, Dana Porter, Loyd Stone and Mahbub Alam.

Title: FUELCOST, Irrigation Fuel Cost Analysis Software Program for Irrigators
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $8,000
Date: 2009 - 2010
Co-PI: Danny Rogers was PI; co-PIs were Mahbub Alam and Dana Porter

Title: Incorporation of Customized Crop Coefficients and Reference ET Values into KanSched, and ET Based Irrigation Scheduling Program (KanSched3)
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $20,000
Date: 2009 - 2010
Co-PI: Danny Rogers was PI; co-PIs were Mahbub Alam and Dana Porter

Title: Online User Profile Tool for the Texas High Plains Evapotranspiration Network
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $50,000
Date: 2008-2009
Co-PI: Thomas Marek was PI; co-PIs were Dana Porter, Jimmy Carroll, Terry Howell, and Patrick Porter
PORTER, DANA

Title:  Field Evaluation of Center Pivot Nozzle Package Application Intensity  
Funded:  USDA-ARS Ogallala Aquifer Program  
Amount:  $30,000  
Date:  2008 - 2009  
Co-PI:  Danny Rogers was PI; Co-PIs were Dana Porter, and Kent Shaw

Title:  Performance evaluation of pressure regulated in-canopy center pivot nozzle packages  
Funded:  USDA-ARS Ogallala Aquifer Program  
Amount:  $16,000  
Date:  2008 - 2009  
Co-PI:  Danny Rogers was PI; Co-PIs were Mahbub Alam, Dana Porter, and Kent Shaw

Title:  Development of GDD Information Software for Improved Crop Management  
Funded:  USDA-ARS Ogallala Aquifer Program  
Amount:  $12,000  
Date:  2008 - 2009  
Co-PI:  Danny Rogers was PI; Co-PIs were Mahbub Alam, Dana Porter

Title:  Irrigation Training Program  
Funded:  Texas Water Development Board via Texas Water Resources Institute subcontract  
Amount:  $20,000  
Date:  2008  
Co-PI: none

Title:  Expanding Applications of the Texas High Plains Evapotranspiration (TXHPET) Network  
Funded:  Texas A&M AgriLife Research Cropping Systems Program  
Amount:  $100,000  
Date:  2007 - 2009  
Co-PI:  Thomas Marek was PI; Dana Porter was Co-PI

Title:  Integrating Grain Crops into a Cotton-based Production System for the High and Rolling Plains: Optimizing Profitability through Efficient Management of Water Resources.  
Funded:  Texas Agricultural Experiment Station Cropping Systems Program  
Amount:  $300,000  
Date:  2007 - 2009  
Co-PI:  Wayne Keeling was PI; Co-PIs were James Bordovsky, John Sij, Gregory T. Church, Dana Porter, Megha Parajulee, Terry Wheeler, Kevin Bronson, Craig Bednarz, Christian Nansen, Jeff Johnson, Randy Boman, Todd Baughman, and Calvin Trostle.

Title:  Applying Subsurface Drip Irrigation Technology to Cropping Systems in the Texas Southern High Plains  
Funded:  Texas Agricultural Experiment Station Cropping Systems Program  
Amount:  $80,000  
Date:  2006 - 2008  
Co-PI:  Jim Bordovsky, Randy Boman, Megha Parajulee, Kevin Bronson, and Wayne Keeling

Title:  Evaluation of CroPMAN/WinEPIC for Water Management in Limited Irrigated Cotton-Sorghum Cropping Systems  
Funded:  Texas Agricultural Experiment Station Cropping Systems Program  
Amount:  $50,000  
Date:  2006 - 2008  
Co-PI:  Jim Bordovsky was PI; Co-PIs were Wyatt Harmon, Eduardo Segarra, and Dana O. Porter

Title:  Managing Alfalfa for Salt Tolerance and High Quality in West Texas  
Funded:  Texas Agricultural Experiment Station Cropping Systems Program  
Amount:  $80,000  
Date:  2006 - 2008  
Co-PI:  Calvin Trostle was PI; Co-PIs were Mike Foster, Bill Thompson, Leonard Lauriault, Dana Porter, and Derek Seasta
PORTER, DANA

Title: Integrated Cotton Production Systems for Optimizing Profitability in Texas Southern High Plains
Funded: Texas Agricultural Experiment Station Cropping Systems Program
Amount: $200,000
Date: 2006 - 2008
Co-PI: Wayne Keeling was PI; Co-PIs were Randy Boman, Jim Bordovsky, Kevin Bronson, Terry Wheeler, Megha Parajulee, Dana Porter, and Eduardo Segarra

Title: Survey and in-field observation of emerging alternative Ogallala region irrigated crops.
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $17,500
Date: 2006-2007
Co-PI: Mahbub Alam was PI; co-PIs were Dana Porter and Danny Rogers.

Title: Cotton Growth Model for the Northern Texas High Plains
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $10,000
Date: 2005-2006
Co-PI: Thomas Marek, Paul Colaizzi, and Jim Bordovsky

Title: Subsurface Drip Irrigation Layout and Maintenance Strategies to Mitigate Effects of Coarse Soil and Water Quality Constraints
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $26,800
Date: 2005 - 2007
Co-PI: Jim Bordovsky

Title: Real World Results: On-Farm Testing of Multiple Stress Tolerant Corn.
Funded: Texas Corn Producers Board
Amount: $5,000
Date: 2005 - 2006
Co-PI: Greg Cronholm was PI; Co-PIs were Patrick Porter and Dana Porter

Title: Efficacy of Fungicides in Soil with Different Application and Watering Practices.
Funded: Texas Peanut Producers Board.
Amount: $22,500
Date: 2005 - 2006
Co-PI: Terry Wheeler was PI; Dana Porter was Co-PI

Title: Ogallala Aquifer Education and Outreach Resources
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $42,000
Date: 2005 - 2007
Co-PI: Dan Rogers, Mahbub Alam, Thomas Marek, Paul Colaizzi, Jim Bordovsky, Kay Ledbetter, Gary Clark, and Kent Shaw

Title: Effect of dripline/crop row orientation
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $34,000
Date: 2004 - 2005
Co-PI: Jim Bordovsky was PI; Dana Porter was co-PI

Title: Development of Peanut Varieties with Resistance to Abiotic Stress
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $8,000
Date: 2004 - 2005
Co-PI: Mark Burow was PI; Co-PIs were John. J. Burke, Dana Porter, and Jennifer Wallace
PORTER, DANA

Title: KanSched-2 Irrigation Scheduling Tool for High Plains Crops
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $27,112
Date: 2004 - 2005
Co-PI: Danny Rogers was PI; Co-PIs were Mahbub Alam and Dana Porter

Title: Ogallala Initiative - Irrigation Systems and Technologies: Sprinkler Irrigation System Evaluations
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $200,000
Date: 2004 - 2008
Co-PI: Freddie Lamm was PI; co-PIs were Paul Colaizzi, Gary Clark, Danny Rogers, Mahbub Alam and Dana Porter

Title: Using the High Plains ET Weather Station Network to Manage Crop Irrigation
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $27,112
Date: 2004 - 2005
Co-PI: Leon New was PI; Co-PIs were Dana Porter, Bob Robinson, Thomas Marek

Title: In-field Survey of Center Pivot Nozzle Packages for Performance
Funded: USDA-ARS Ogallala Aquifer Program
Amount: $27,112
Date: 2004 - 2005
Co-PI: Danny Rogers was PI; co-PIs were Dana Porter and Mahbub Alam

Title: Texas A&M AgriLife Extension Service Public Outreach and Education
Funded: Texas Commission on Environmental Quality
Amount: $44,012
Date: 2004 - 2005
Co-PI: Bruce Lesikar was PI; Co-PIs were Dana Porter and Monty Dozier

Title: AgriLife Extension Service Best Management Practice Education and Training
Funded: Texas Commission on Environmental Quality
Amount: $30,000
Date: 2003 - 2004
Co-PI: none

Title: Comparison and Interpretation of COTMAN Growth Curves Arising from Varying Irrigation Regimes in the Texas High Plains
Funded: Cotton Incorporated
Amount: $11,500
Date: 2004
Co-PI: none

Title: Irrigation Water Management: Irrigation Scheduling and Application Methods
Funded: Texas Peanut Producers Board
Amount: $15,900
Date: 2003 - 2004
Co-PI: A.M. Schubert, T.A. Wheeler, J.P. Bordovsky, and J. Reed

Title: A Survey of West Texas Peanut Fields to Determine the Frequency of Pod Rot Diseases and Testing of Pythium Pod Rot Fungicides
Funded: Texas Peanut Producers Board
Amount: $15,000
Date: 2003 - 2004
Co-PI: Terry Wheeler was PI; Dana Porter was Co-PI
PORTER, DANA

Title: Water Management in Peanut Systems with Emphasis on Site-Specific Approaches for Sustainable Yields of High Quality Peanuts
Funded: Texas Agricultural Experiment Station Cropping Systems Program
Amount: $26,000
Date: 2003-2004
Co-PI: A. Michael Schubert

Title: Climate Data Support for Precision Agriculture in the Texas High Plains.
Funded: Texas Agricultural Experiment Station Cropping Systems Program
Amount: $13,200
Date: 2003 - 2004
Co-PI: Thomas Marek

Title: Improved Water Use Efficiency Using Irrigation Management Technology
Funded: National Peanut Board
Amount: $4,000
Date: 2003
Co-PI: Thomas Marek was PI; Dana Porter was co-PI

Title: North Plains and South Plains EvapoTranspiration Network Proposal
Funded: High Plains Underground Water Conservation District No. 1
Amount: $5,000
Date: 2002 - 2003
Co-PI: Thomas Marek was PI; Dana Porter was Co-PI

Title: Comparison and Interpretation of COTMAN Growth Curves Arising from Varying Irrigation Regimes in the Texas High Plains
Funded: Cotton Incorporated
Amount: $11,500
Date: 2003
Co-PI: Jim Leser was PI; Co-PIs were Randy Boman, Dana Porter, Jim Bordovsky

Title: Irrigation Management and Drought Stress Resistance
Funded: National Peanut Board
Amount: $10,500
Date: 2002
Co-PI: Mike Schubert was PI; Dana Porter was Co-PI

Funded: Texas Department of Agriculture and USDA
Amount: $43,074
Date: 2001 - 2002
Co-PI: R. Patrick Porter was PI; Co-PIs were G.L. Schuster, and D.O. Porter

Title: Irrigation Water Management: Irrigation Scheduling and Application Methods (project continuation)
Funded: Texas Peanut Producers Board
Amount: $12,500
Date: 2001
Co-PI: A.M. Schubert, and J.P. Bordovsky

Title: Precision Agriculture in Peanut Systems.
Funded: Precision Agriculture Initiative for the Texas High Plains. Texas A&M AgriLife Research.
Amount: $163,695
Date: 2000-2001
Co-PI: A. Michael Schubert was PI; Co-PIs were Dana Porter, Jim Bordovsky, Kevin Bronson, Peter Dotray, Wayne Keeling, Terry Wheeler, Harold Kaufman, Calvin Trostle, Clyde Crumley, Phillip Kidd, John Farris, G.S. Osborn, Leslie Thompson
PORTER, DANA

Title: High Plains Cropping Systems: On-Farm Limited Irrigation Sorghum/Cotton Rotation vs. Continuous Cotton (Project renewal)
Funded: TAMUS Sorghum PROFIT Initiative
Amount: $5,300
Date: 2000 - 2001
Co-PI: Calvin Trostle

Title: Increasing Sorghum PROFITability in the Southern High Plains through Extension Education and Sorghum-Cotton Rotation
Funded: TAMUS Sorghum PROFIT Initiative
Amount: $207,500
Date: 2000 - 2001
Co-PI: Calvin Trostle was PI; Co-PIs were Gary Peterson, Dan Krieg, and Pat Porter. Dana Porter, Jim Bordovsky, Kevin Bronson, and Jim Bordovsky

Title: Irrigation Water Management: Irrigation Scheduling and Application Methods
Funded: Texas Peanut Producers Board
Amount: $23,500
Date: 2000
Co-PI: A.M. Schubert, J.P. Bordovsky, Calvin Trostle, and Dan Krieg

Title: Cost-effective Production Management of Peanuts in the Texas Southern High Plains
Funded: Texas Peanut Producers Board
Amount: $69,500
Date: 1999 - 2000
Co-PI: Mike Schubert was PI; Co-PIs were Dana Porter, Jim Bordovsky, Kevin Bronson, Cary J. Green, Calvin Trostle, and Robert Lemon

Title: High Plains Cropping Systems: On-Farm Limited Irrigation Sorghum/Cotton Rotation vs. Continuous Cotton
Funded: TAMUS Sorghum PROFIT Initiative
Amount: $5,300
Date: 1999 - 2000
Co-PI: Calvin Trostle
SEARCY, STEVE

Title: Engineered System for Seed Cotton Handling, Storage and Ginning
Funded: Cotton, Inc. Texas State Support Committee
Amount: $175,262
Date: 2004-2006
Co-PI: none

Title: Engineered System for Seed Cotton Handling, Storage and Ginning
Funded: Texas Food and Fibres Commission
Amount: $87,682
Date: 2004-2006
Co-PI: none

Title: Engineered Systems for Seed Cotton Handling, Storage and Ginning
Funded: National Cotton Foundation
Amount: $46,000
Date: 2003-2006
PI: none

Title: Remote Sensing and Variable Rate Technology for Citrus Pest Management and Impact on Water Quality
Funded: Texas Advanced Technology Program
Amount: $96,000
Date: 2004-2006
Co-PI: none

Title: Integration of Plant Height Mapping with COTMAN
Funded: Deere & Co.
Amount: $36,016
Date: 2003-2004
Co-PI: none

Title: Integration of Plant Height Mapping with COTMAN
Funded: Cotton, Inc.
Amount: $46,000
Date: 2003-2004
Co-PI: none

Title: Maintaining Cotton Lint and Seed Quality during building and Storage
Funded: Texas Feed and Fiber Commission
Amount: $41,500
Date: 2002-2003
Co-PI: none

Title: Maintaining Cotton Lint and Seed Quality during building and Storage
Funded: Cotton Foundation
Amount: $15,000
Date: 2002-2004
Co-PI: none

Title: Maintaining Cotton Lint and Seed Quality during building and Storage
Funded: Cotton, Inc.
Amount: $33,441
Date: 2003
Co-PI: none

Title: Effect of Defoliation Method on Pepper Trash Content
Funded: Cotton, Inc.
Amount: $25,000
Date: 2001
Co-PI: none
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<thead>
<tr>
<th>Title</th>
<th>Funded</th>
<th>Amount</th>
<th>Date</th>
<th>Co-PI</th>
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<tbody>
<tr>
<td>Yield Mapping for Stripper Harvested Cotton</td>
<td>AgLeader Technologies, Inc.</td>
<td>$2,944</td>
<td>2000</td>
<td>none</td>
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<td>Yield Mapping for Stripper Harvested Cotton</td>
<td>MicroTrak, Inc.</td>
<td>$2,598</td>
<td>2000</td>
<td>none</td>
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<td>Assessment of Growth and Yield Variability for Site-Specific Management</td>
<td>Cotton, Inc.</td>
<td>$40,000</td>
<td>1999-2000</td>
<td>none</td>
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<tr>
<td>Evaluation of Corn Height and Population Sensing</td>
<td>Monsanto, Inc.</td>
<td>28,125</td>
<td>1998-1999</td>
<td>None</td>
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<tr>
<td>Evaluation and Development of a Precision Management System for the Management of Crops in South Texas</td>
<td>Micro-Flo, Inc.</td>
<td>8,500</td>
<td>1998</td>
<td>None</td>
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<td>Water Quality Benefits of Precision Farming</td>
<td>Texas State Soil and Water Conservation Board</td>
<td>300,066</td>
<td>1997-2000</td>
<td>George Sabbagh, Ann Kenimer</td>
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<td>Prediction of Nitrogen Stress Using Reflectance Techniques</td>
<td>Binational Agricultural Research and Development Fund</td>
<td>360,000</td>
<td>1997-2001</td>
<td>None</td>
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<td>Yield Mapping for Field Scale Rice Research</td>
<td>Texas Rice Research Foundation ($86,936), Rice Belt Warehouse ($22,500)</td>
<td>109,436</td>
<td>1996-1998</td>
<td>None</td>
</tr>
<tr>
<td>Evaluation and Development of a Precision Management System for the Management of Crops in South Texas</td>
<td>King Ranch ($150,000), John Deere ($33,000), Cotton, Inc. ($60,000), National Cotton Foundation ($10,000), Rockwell ($10,360)</td>
<td>263,360</td>
<td>Co-PI: None</td>
<td></td>
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<td>Evaluation of Zycom Cotton Yield Mapping System</td>
<td>Zycom Inc.</td>
<td>7,000</td>
<td>1997</td>
<td>None</td>
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SHAW, BRYAN

**Title:** Size Distribution and Its Effect on Sampling Performance of Particulate Matter in Concentrated Animal Feeding Operations

**Funded:** USDA/CSREES  
**Amount:** $500,000  
**Date:** 2006-2009  
**Co-PI:** Yuanhui Zhang

**Title:** Development of 3 chapters of the USDA National Engineering Handbook – Fugitive Dust, Chemical Drift, and Visibility  
**Funded:** USDA-NRCS Gulf Coast Cooperative Ecosystem Studies Unit  
**Amount:** $120,000  
**Date:** 2005-2006  
**Co-PI:** Brent W. Auvermann

**Title:** Emissions from Dairies  
**Funded:** USDA/CSREES  
**Amount:** $150,000  
**Date:** 2003-2006  
**PI:** Parnell, Lacey

**Title:** Emissions from Cattle Feedyards  
**Funded:** USDA/CSREES  
**Amount:** $800,000  
**Date:** 2003-present  
**Co-PI:** Parnell, Lacey, Mukhtar

**Title:** Development and Maintenance of Agricultural Air Quality Task Force (AAQTF) Website  
**Funded:** USDA-NRCS Gulf Coast Cooperative Ecosystem Studies  
**Amount:** $13,000  
**Date:** 2003  
**Co-PI:** none

**Title:** Literature Review and White Paper Development on Sources and Control of Emissions from Cropping and Animal Feeding Operations  
**Funded:** USDA-NRCS Gulf Coast Cooperative Ecosystem Studies  
**Amount:** $25,000  
**Date:** 2003-2006  
**Co-PI:** none

**Title:** Cyclone Testing  
**Funded:** The Cotton Foundation  
**Amount:** $15,000  
**Date:** 2003  
**Co-PI:** Parnell

**Title:** Dispersion Modeling for Agricultural Sources  
**Funded:** The Cotton Foundation  
**Amount:** $15,000  
**Date:** 2003  
**Co-PI:** Parnell

**Title:** Evaluation of FRM PM Samplers  
**Funded:** The Cotton Foundation  
**Amount:** $45,000  
**Date:** 2003-2006  
**Co-PI:** Parnell

**Title:** Air Quality Legislative Initiative  
**Funded:** State of Texas  
**Amount:** $900,000  
**Date:** 1999-2006  
**Co-PI:** Parnell, Lacey, Mukhtar
SHAW, BRYAN

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<tr>
<th>Title:</th>
<th>Agricultural Air Quality Fine Particle Project</th>
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<tr>
<td>Funded:</td>
<td>TNRCC</td>
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<tr>
<td>Amount:</td>
<td>$100,000</td>
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<td>Date:</td>
<td>1999</td>
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<td>Co-PI:</td>
<td>Parnell, Lacey, Auvermann</td>
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</table>

| Title: | Texas AgrAbility - Texas Farmers and Ranchers with Disabilities Identification and Accommodation Network |
| Funded: | USDA-CSREES |
| Amount: | $420,000 |
| Date: | 1998-2002 |
| Co-PI: | none |

| Title: | Feed Mill Emission Factors Associated with Air Pollution Regulation of Cattle Feed Yards |
| Funded: | Texas Cattle Feeders Association/National Cattlemen's Association |
| Amount: | $80,000 |
| Date: | 1996 |
| PI: | Parnell |

| Title: | Effect of Various Cotton Production Management Practices on Particulate Emissions |
| Funded: | TAEX |
| Amount: | $2,000 |
| Date: | 1996-1997 |
| Co-PI: | None |

| Title: | Dispersion Modeling of Ground Level Sources of Particulate and Odors |
| Funded: | State of Texas – REP |
| Amount: | $39,000 |
| Date: | 1996-1997 |
| Co-PI: | Parnell, Auvermann |
SMITH, PATRICIA

Title: Cintron University Professor for Undergraduate Teaching Excellence  
Funded: Texas A&M University  
Amount: $30,000

Title: Preparing Underrepresented Scholars for Challenges in Agricultural Biosecurity and Sustainability-A Research and Leadership PhD Program  
Funded: USDA CSREES National Needs  
Amount: $229, 500  
Co-PIs: Y. Huang, (PD), R. Karthikeyan, C. Munster, S. Mukhtar, M. Pina

Title: Preparing Underrepresented Scholars for Research Careers in BAEN and Veterinary Medicine  
Funded: USDA Multicultural Scholars Program  
Amount: $144,000, All under direct control  
Date: 2007-2011  
Co-PIs: C. Munster, V. Singh M. Pina, K. Rogers

Title: Modeling the effect of urbanization and optimizing land use for estuarine environmental flows  
Funded: USGS  
Amount: $4813  
Date: 2006-2007  
Co-PI: Debabrata Sahoo

Title: Water in the Environment  
Funded: NSF-Information Technology in Science (ITS)  
Amount: $100,000; $40,000 under direct control  
Date: 2004-2006  
Co-PI: Ann Kenimer

Title: Effects of urbanization on ecological services in a semi-arid region of the United States  
Funded: NASA LCLUC (NRA-00-OES-8)  
Amount: $599,234; $33,000 under direct control  
Date: 2001-2004  
PI: Ron Lacey, Urs Kreuter, Richard Conner

Title: Environmental education resource for human and ecological risk assessment  
Funded: NSF-Information Technology in Science (ITS)  
Amount: $168,000; $84,000 under direct control  
Date: 2000-2002  
Co-PI: Robin Autenreith

Title: Effect of water reuse on freshwater inflows to a gulf coast estuary  
Funded: TWRI  
Amount: $6750  
Date: 2003  
Co-PI: None
THOMASSON, J. ALEX
Title: Effects of High Compression Levels on Quality of Cotton Fiber and Seed (Crossed with Storage Time and Moisture (Crossed with Storage Time and Moisture Content)
Funded: Case New Holland
Amount: $191,200
Date: July 1, 2013 to June 30, 2014
Co-PI: Y. Ge, formerly with Department of Biological & Agricultural Engineering, Texas A&M University

Title: Improving Farm Productivity in Africa through Culturally Appropriate Technologies
Funded: Howard G. Buffett Foundation
Amount: $206,000
Date: July 1, 2012 to June 30, 2015
Co-PI: Y. Ge, formerly with Department of Biological & Agricultural Engineering, Texas A&M University

Title: A multi-sensor platform for field-oriented, high-throughput energy sorghum phenotyping
Funded: Texas Bioenergy Initiative
Amount: $150,000
Date: July 1, 2012 to June 30, 2015
Co-PI: Y. Ge, formerly with Department of Biological & Agricultural Engineering, Texas A&M University

Title: Unmanned Flight Test of Intuitive Machine’s Observation Pod for Precision Agriculture Application
Funded: Intuitive Machines Corporation and TEES
Amount: $38,800
Date: July 1, 2014 to December 31, 2014
Co-PI: J. Valasek, Department of Aerospace Engineering, Texas A&M University

Title: Bioenergy Alliance High-Tonnage Bioenergy Crop Production and Conversion into Conventional Fuels (Task C: High-Tonnage Bioenergy Sorghum Production Logistics)
Funded: U.S. Department of Energy
Amount: $2,000,000 ($492,000 under Thomasson’s direct control)
Date: January 1, 2008 to December 31, 2010
Co-PI: S. Searcy and R. Sui, Department of Biological & Agricultural Engineering, Texas A&M University

Title: National Alliance for Advanced Fuels and Bio-Products (Sub-task: Sensing and Control for Industrial Algae Production and Harvesting)
Funded: U.S. Department of Energy
Amount: $50,000,000 ($325,000 under Thomasson’s direct control)
Date: April 1, 2010 to March 31, 2013
Co-PI: Numerous members of large consoritum

Title: Strategic Fuel Supply Project (Task 100.4 – Fabricate in-situ Sensor for Monitoring Algae)
Funded: U.S. Department of Defense
Amount: $1,000,000 ($140,000 under Thomasson’s direct control)
Date: January 1, 2008 to December 31, 2009
Co-PI: R. Lacey

Title: Ground-Based Technologies for Cotton Root Rot Control
Funded: Cotton Incorporated
Amount: $231,000
Date: January 1, 2010 to December 31, 2015
THOMASSON, J. ALEX

- **Title:** Global Tracing and Recall System for U.S. Grains  
  **Funded:** USDA-CSREES  
  **Amount:** $230,338  
  **Date:** Jan. 1, 2005 to Feb. 28, 2006  
  **Co-PI:** T. Herrman, Office of Texas State Chemist, Texas A&M University

- **Title:** Integrating Cotton Quality Information between Gin and Farm  
  **Funded:** Cotton Foundation  
  **Amount:** $10,000  
  **Date:** Jul. 1, 2005 to Jun. 30, 2006  
  **Co-PI:** R. Sui, Department of Biological & Agricultural Engineering, Texas A&M University

- **Title:** Integrating Cotton Quality Information between Gin and Farm  
  **Funded:** Texas Food & Fiber Commission  
  **Amount:** $10,000  
  **Date:** Jul. 1, 2005 to Jun. 30, 2006  
  **PI:** R. Sui, Department of Biological & Agricultural Engineering, Texas A&M University

- **Title:** Physical Model of Lint Cleaning  
  **Funded:** Cotton Incorporated  
  **Amount:** $321,000  
  **Date:** Jul. 1, 2005 through Dec. 31, 2006  
  **Co-PI:** Formerly R. Sui, Department of Biological & Agricultural Engineering, Texas A&M University

- **Title:** Cotton Fiber Quality Sensor for In-situ Measurement and Harvest Segregation  
  **Funded:** Texas Cropping Systems Research Program  
  **Amount:** $100,000  
  **Date:** Oct. 1, 2005 through Sep. 30, 2006  
  **Co-PI:** C. Morgan, Department of Soil and Plant Science, Texas A&M University

- **Title:** Biosphere Productive Cap’y for Ag. Yield Estim. & Food Security Decision Support  
  **Funded:** GeoResources Institute, Mississippi State University/NASA  
  **Amount:** $477,841  
  **Date:** Jul. 1, 2004 to Jun. 30, 2005  
  **Co-PI:** D. Reynolds, Department of Plant & Soil Sciences, Mississippi State University

- **Title:** Gasification System for Converting Biomass to Synthesis Gas  
  **Funded:** USDA, Special Project on Biomass-Energy Research with Oklahoma State University  
  **Amount:** $350,100  
  **Date:** Jul. 1, 2001 to Jun. 30, 2004  
  **Co-PI:** R. M. Bricka, Dept. of Chem. Engr., Mississippi State University

- **Title:** Robotic Plant Handling for Horticultural Operations  
  **Funded:** USDoL, Spec. Proj. on Robotics & Automated Sys. for Mississippi Nursery Industry  
  **Amount:** $120,330  
  **Date:** Jul. 1, 2003 to Jun. 30, 2004  
  **Co-PI:** R. Sui, Agricultural & Biological Engineering, Mississippi State University

- **Title:** Optical Yield Monitor for Pneumatically Conveyed Crops  
  **Funded:** USDA/Mississippi State University Proj.: Advanced Spatial Technologies in Ag.  
  **Amount:** $77,000  
  **Date:** Apr. 1, 2002 to Mar. 31, 2004  
  **Co-PI:** R. Sui, Dept. of Agr. and Biol. Engineering, Mississippi State University

- **Title:** Ultra-high resolution Mobile Sensing of Plant Health  
  **Funded:** USDA/Mississippi State University Proj.: Applications of Spatial Technologies in Ag.  
  **Amount:** $57,050  
  **Date:** Apr. 1, 2002 to Mar. 31, 2004  
  **Co-PI:** R. Sui, Dept. of Agr. and Biol. Engineering, Mississippi State University
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<thead>
<tr>
<th>Title</th>
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<tr>
<td>FTIR and UV/Vis/NIR Spectrometry for Characterizing Ag. Material Properties</td>
<td>USDA/Mississippi State University Proj.: Applications of Spatial Technologies in Ag.</td>
<td>$210,872</td>
<td>Apr. 1, 1998 to Mar. 31, 2002</td>
<td>R. Sui, Dept. of Agricultural &amp; Biological Engineering, Mississippi State University</td>
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<td>Advanced Optical Cotton Yield Monitor</td>
<td>USDA/Mississippi State University Proj.: Advanced Spatial Technologies in Ag.</td>
<td>$103,080</td>
<td>Jan. 1, 2000 to Mar. 31, 2002</td>
<td>R. Sui, Dept. of Agr. and Biol. Engineering, Mississippi State University</td>
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<td>Multi-Product Variable-Rate Controller for Simult. Precision Applic. of Ag. Inputs</td>
<td>USDA/Mississippi State University Project: Advanced Spatial Technologies in Ag.</td>
<td>$73,750</td>
<td>Apr. 1, 2001 to Mar. 31, 2002</td>
<td>J. L. Willers, USDA-ARS</td>
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<td>GPS Positioned Autonomous Guided Vehicle (AGV) for Precision Ag. Applications</td>
<td>USDA/Mississippi State University Project: Advanced Spatial Technologies in Ag.</td>
<td>$62,114</td>
<td>Apr. 1, 2001 to Mar. 31, 2002</td>
<td>T. N. Burcham, Dept. of Agr. and Biol. Engineering, Mississippi State University</td>
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<td>Quality Segregation in Cotton Production</td>
<td>Strategic Research Initiative, Mississippi State University</td>
<td>$115,000</td>
<td>Jul. 1, 1999 to Dec. 31, 2001</td>
<td>M. S. Cox, Dept. of Plant &amp; Soil Sci., Mississippi State University</td>
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<td>Development of a Phytologically-Based Biosorptive Water Treatment Process</td>
<td>Gulf Coast Hazardous Substance Research Center</td>
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<td>Jan. 1, 2001 to Dec. 31, 2001</td>
<td>M. Zappi, Dept. of Chemical Engineering, Mississippi State University</td>
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<td>Amount</td>
<td>Date</td>
<td>Co-PI</td>
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<td>------------------------------------------------------</td>
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<tr>
<td>Soil Characterization for Improved Utilization of Remote Sensing in Agriculture</td>
<td>USDA/Mississippi State University Project: Advanced Spatial Technologies in Ag.</td>
<td>$113,495</td>
<td>Apr. 1, 1999 to Mar. 31, 2000</td>
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<td>Odor Analysis with FTIR Spectrometry</td>
<td>Mississippi Ag. &amp; Forestry Exp. Station/Office of Research, Mississippi State Univ.</td>
<td>$16,000</td>
<td>Apr. 1, 1999 to Mar. 31, 2000</td>
<td>T. N. Burcham, Dept. of Agr. and Biol. Engineering, Mississippi State University</td>
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<td>Image-Processing-Based Color Meas. to Detect “Spottiness” during Cotton Grading</td>
<td>Research Initiation Program, Office of Research, Mississippi State University</td>
<td>$6,000</td>
<td>Dec. 1, 1997 to Nov. 30, 1998</td>
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<td>Broadly Applicable Data-Acquisition System for Engineering Research</td>
<td>Research Facilitation Award Program, Office of Research, Mississippi State University</td>
<td>$500</td>
<td>Oct. 16, 1997 to June 30, 1998</td>
<td>N/A</td>
</tr>
</tbody>
</table>
SELF-STUDY REPORT

UNDERGRADUATE ENGINEERING PROGRAM

Biological and Agricultural Engineering Department
College of Agriculture and Life Sciences
The Dwight Look College of Engineering
Texas A&M University
College Station, TX

January 20, 2015

Modified and updated from ABET Self-Study conducted in 2010 and prepared for:

Biological and Agricultural Engineering Program Review
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BACKGROUND INFORMATION

A. Contact information

<table>
<thead>
<tr>
<th>Department Head:</th>
<th>ABET Coordinator:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Stephen W. Searcy</td>
<td>Dr. Patricia K. Smith</td>
</tr>
<tr>
<td>Biological and Agricultural Engineering</td>
<td>Biological and Agricultural Engineering</td>
</tr>
<tr>
<td>2117 TAMU</td>
<td>2117 TAMU</td>
</tr>
<tr>
<td>College Station, TX 77843-2117</td>
<td>College Station, TX 77843-2117</td>
</tr>
<tr>
<td>Phone: 979.845.3931</td>
<td>Phone: 979.845.3630</td>
</tr>
<tr>
<td>Fax: 979.845.3932</td>
<td>Fax: 979.845.3932</td>
</tr>
<tr>
<td><a href="mailto:s-searcy@tamu.edu">s-searcy@tamu.edu</a></td>
<td><a href="mailto:patti-smith@tamu.edu">patti-smith@tamu.edu</a></td>
</tr>
</tbody>
</table>

B. Program History

The Agricultural Engineering Department was established at Texas A&M University in 1915. In 1950, the Agricultural Engineering (AGEN) program at Texas A&M became an accredited engineering program.

The AGEN program traditionally included an introductory botany course in the curriculum, and in 1976 a food engineering option was established which included several food science courses. In 1988, the botany course was replaced with introductory biology, and an introductory biochemistry course was added in response to the growing demand for engineers who had a good understanding of biological sciences. In 1997, the food engineering option was changed to a separate B.S. degree program in Biological Systems Engineering (BSEN) in response to trends across the country for engineering graduates with a better understanding of biological science.

In 2001, the name of the department was changed from Agricultural Engineering to Biological and Agricultural Engineering and the names of the M.S., M.Eng. and Ph.D. degrees offered were changed to Biological and Agricultural Engineering as well. These changes reflected the evolution of departmental programs over the previous half century as well as changes in the profession at the national level. Also, in 2001 substantial changes were made to both the AGEN and BSEN programs which resulted in the two curricula being identical except for four courses. With those changes, the two programs began functioning more like two options rather than separate degree programs, so in 2006, the two curricula were merged into a single curriculum in Biological and Agricultural Engineering (BAEN). The first students with a B.S. in BAEN graduated in 2010, and we requested that ABET change the name of the program in agricultural engineering at Texas A&M to Biological and Agricultural Engineering for this review cycle. The BSEN program was terminated, and the last students graduated with this degree in May 2009.

Over the past six years the BAEN program has averaged 194 undergraduate students annually—ranging from 149 in the 2009-2010 academic year to 225 in 2013-2014—and 75 graduate students. During this same time period an average of 29 B.S. students, and 15 graduate students of all types, graduated annually. Also, during the past five years the number of faculty teaching in the BAEN program has decreased from 21 to 20.
C. Options
There are no options, tracks, or concentrations offered in the BAEN program at Texas A&M.

D. Organizational Structure
The BAEN program at Texas A&M University is jointly administered by the College of Agriculture and Life Sciences (COALS) and the Dwight Look College of Engineering (COE). New courses, course changes and curriculum changes are approved by the curriculum committees in both colleges and signed by the associate deans for academic programs of both colleges before being forwarded to the University Curriculum Committee (UCC). Changes approved by the UCC must then be approved by the Faculty Senate and signed by the President of the University.

E. Program Delivery Modes
The traditional lecture/laboratory delivery mode is used for all departmental courses as well as for most courses BAEN students take outside the department. A few TAMU courses are web-based, and students may occasionally take web-based or correspondence courses from other institutions for transfer credit.

CRITERION 1. STUDENTS

A. Student Admissions
Freshmen are admitted to Texas A&M University (TAMU) based on high school ranking, SAT or ACT score, and other criteria as discussed in the undergraduate catalog (pages 40-49, Ed. 137, http://catalog.tamu.edu/pdfs/14-15_UG_Catalog.pdf). The Office of Admissions decides which students are to be admitted into TAMU. Generally freshman admission to the university falls into three categories: top 10% from Texas high schools, academic admits, and other applications. Freshman admissions to Biological and Agricultural Engineering (BAEN) over the past five years are summarized in Table 1-1.

Table 1-1. History of Admissions Standards for Freshmen Admissions for Past Five Years

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Composite ACT</th>
<th>Composite SAT</th>
<th>Percentile Rank in High School</th>
<th>Number of New Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN.</td>
<td>AVG.</td>
<td>MIN.</td>
<td>AVG.</td>
</tr>
<tr>
<td>2010-2011</td>
<td>21</td>
<td>27.3</td>
<td>900</td>
<td>1187</td>
</tr>
<tr>
<td>2011-2012</td>
<td>20</td>
<td>27.5</td>
<td>920</td>
<td>1230</td>
</tr>
<tr>
<td>2012-2013</td>
<td>22</td>
<td>26.8</td>
<td>990</td>
<td>1205</td>
</tr>
<tr>
<td>2013-2014</td>
<td>21</td>
<td>26.3</td>
<td>990</td>
<td>1175</td>
</tr>
<tr>
<td>2014-2015</td>
<td>19</td>
<td>24.9</td>
<td>880</td>
<td>1168</td>
</tr>
</tbody>
</table>

Top 10% from Texas High Schools—Students who are Texas residents or enrolled in recognized Texas public or private high schools with a rank in the top 10% of their graduating class are automatically admitted into TAMU, but not necessarily to the major of choice. These applicants must submit all required credentials by the closing date to qualify for automatic admission.
**Academic Admits**—Automatic admission to TAMU is granted to domestic applicants who rank in the top 25% of their high school graduating class, achieve a combined SAT math and SAT critical reading score of at least 1300, with a test score of at least 600 in each of these components of the SAT, or a composite ACT score of at least 30 with a test score of at least 27 in ACT math and ACT English, and meet minimum coursework. These applicants are not necessarily admitted to the major of choice and must submit all required credentials by the closing date to qualify for automatic admission.

**Other Applications**—Students not admitted through the first two categories are evaluated on a case-by-case basis in a holistic manner. Factors considered in these admission decisions include the student’s progress and academic record on required high school preparatory courses, evidence of leadership and/or service work as indicated in their application packet, awards and achievements earned in high school, employment and/or internships, other extracurricular activities, family educational background and household income, and their application essays.

The department does not have an opportunity to participate in the decision process for admission of new freshmen. Students interested in BAEN are admitted as general engineering students in The Dwight Look College of Engineering. Admitted students follow the first-year engineering curriculum. Students apply to specific engineering major(s) through the Entry-to-a-Major process after completing specified course work ([http://engineering.tamu.edu/academics/advisors-procedures/entry-to-a-major](http://engineering.tamu.edu/academics/advisors-procedures/entry-to-a-major)). General engineering students are required to complete at least three courses at Texas A&M—one course from each category of math, science and engineering—before they can apply to a major. Acceptance to a major is competitive. Departments review entry-to-a-major applications and admit students based on a holistic review that includes GPA, extra-curricular activities, an essay and other factors. All new freshmen students entering the Dwight Look College of Engineering are required to take a math placement test prior to coming to campus for their new student conference. Scores obtained on this math placement test are used to determine the most appropriate first course in mathematics and science. Students scoring less than a 22 must take MATH 150 Pre-Calculus. Students scoring between 22 and 26 are directed to take MATH 151 and CHEM 107/117 and students scoring 27 or higher are directed to take MATH 151 and PHYS 218. While the resulting recommended math course is strongly encouraged during advising and registration, the students may register for a lower level MATH course if they do not feel ready for MATH 151.

**B. Evaluating Student Performance**

At the end of each semester, the Academic Advisor reviews each student’s grade report to identify any who are below a 2.0 GPR overall or below a 2.0 GPR for the semester. Students not meeting these criteria may be blocked from continuing in BAEN, placed on scholastic probation, or given a warning about their poor performance. These students also are counseled regarding impediments to their academic success, and their plans to overcome these are discussed with them. Students placed on academic probation are encouraged to attend a Fresh Start Orientation with the TAMU Academic Success Center and create and complete a Success Plan.

Departmental policy requires that students obtain a grade of C or better in all engineering, mathematics, and science courses. At the end of each semester, the Academic Advisor also reviews each student's grade report and notifies students if they need to repeat a course. Since students have already registered for the next semester, the Academic Advisor works with students who need to revise their schedule.
In June, 2011 the Texas State Legislature enacted TEC§51.9685 requiring all undergraduate students to file a degree plan no later than the term immediately following the term in which the student earned 45 credit hours. The degree plan must be approved by the Academic Adviser. Any student who does not have an approved plan meeting 100% of their degree requirements will be blocked from registration. The degree planner is available on-line through the Howdy Portal. The degree planner shows students the progression toward their degree. Additionally, at the beginning of their senior year, each student’s degree plan is reviewed by the Academic Advisor and remaining requirements are summarized for each student. This degree evaluation is repeated at the beginning of the student's last semester to make sure no requirements are missing.

Requests for substitutions in a student's degree plan are routed through the Advising Coordinator for approval. The Advising Coordinator ensures that substitutions are consistent with the degree program’s objectives and outcomes and ABET requirements.

C. Advising Students

All engineering teaching faculty within the department are involved in advising BAEN students with regard to curriculum issues, career guidance and the profession. The department has an Advising Coordinator for Undergraduate Engineering Programs (currently Dr. Patricia K. Smith, Associate Professor) and an Academic Advisor (currently Ms. Ashlea Schroeder, Senior Academic Advisor I). The Advising Coordinator monitors the overall advising effort within the department, serves on the Undergraduate Advisors Committee of the Dwight Look College of Engineering, and maintains close liaison with the Academic Program Offices in both the engineering college and the College of Agriculture and Life Sciences to be knowledgeable of any changes or concerns that may affect the BAEN program. In addition, the Advising Coordinator chairs the Engineering Undergraduate Program Committee (EUPC), meets with students interested in the program, works with incoming undergraduate engineering students to develop their course schedules, and makes decisions on scholastic probation and blocking for academic deficiency. The Academic Advisor assists the Advising Coordinator, conducts initial evaluation of students regarding scholastic probation and blocking for academic deficiency, maintains departmental undergraduate student records, and handles much of the routine contact with students on advising issues. The Academic Advisor also serves as the departmental representative on the COALS Undergraduate Programs Committee.

Each student entering the BAEN program is assigned a faculty advisor. If a student has a particular area of interest, he or she is assigned to a faculty member with expertise in that area. The Advising Coordinator and Academic Advisor are available to assist students on matters with which the faculty advisor is unfamiliar. Students are required to meet with their faculty advisors at least once each semester to review courses they plan to take the following semester and discuss any other concerns they may have. This is accomplished by blocking all students from registering each semester until they meet with their faculty advisor. Each semester, the Advising Coordinator prepares advising notes that are distributed to students and faculty by email and posted on the departmental web site prior to each registration period.

Faculty advisors and students use a curriculum check sheet (Table 1-2) as a guide in the selection of courses. Each student in consultation with his or her faculty advisor selects elective courses. Core curriculum electives are selected from an approved university list (pages 17-19, Ed. 137, http://catalog.tamu.edu/pdfs/14-15_UG_Catalog.pdf, and core.tamu.edu). Engineering and math electives are selected from a departmental approved list of courses (Table 1-3). During each
advising session, faculty advisors list courses to be taken during the next term on an advising form which is kept in the student’s academic file in case questions arise regarding what the student was advised to take relative to the courses for which the student actually registered.
Table 1-2. Biological and Agricultural Engineering Unofficial Degree Plan.

<table>
<thead>
<tr>
<th>GR</th>
<th>COURSE</th>
<th>CR.</th>
<th>PREREQUISITE</th>
<th>CR.</th>
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<td>MATH 151*</td>
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<td>MEEN 221 (2-2)</td>
<td>3</td>
<td>MATH 251; PHYS 218</td>
<td></td>
<td>BAEN 320 (2-2)</td>
<td>3</td>
</tr>
<tr>
<td>MEEN 222 (3-0)</td>
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<td>CHEM 107; PHYS 218</td>
<td></td>
<td>CVEN 305 (3-0)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 251 (3-0)</td>
<td>3</td>
<td>MATH 152</td>
<td></td>
<td>ENGL 210 (3-0)</td>
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</tr>
<tr>
<td>PHYS 208 (3-3)</td>
<td>4</td>
<td>MATH 152; PHYS 218</td>
<td></td>
<td>MATH 308 (3-0)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td></td>
<td></td>
<td>MATH 251</td>
<td></td>
</tr>
<tr>
<td>JUNIOR</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BAEN 302 (3-3)</td>
<td>4</td>
<td>BIOL 113, CHEM 222*</td>
<td></td>
<td>BAEN 365 (2-3)</td>
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</tr>
<tr>
<td>BAEN 340 (3-0)</td>
<td>3</td>
<td>MEEN 221</td>
<td></td>
<td>BAEN 366 (3-0)</td>
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</tr>
<tr>
<td>BAEN 354 (2-3)</td>
<td>3</td>
<td>MEEN 222</td>
<td></td>
<td>BAEN 370 (2-2)</td>
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<tr>
<td>BAEN 375 (3-0)</td>
<td>3</td>
<td>CVEN 305</td>
<td></td>
<td>ECEN 215</td>
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<tr>
<td>ECEN 215 (2-2)</td>
<td>3</td>
<td>MEEN 221; PHYS 208; MATH 308*</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td></td>
<td></td>
<td>American Hist. El.</td>
<td>3</td>
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<tr>
<td>SENIOR</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>BAEN 479 (2-2)</td>
<td>3</td>
<td>BAEN 340, 305, (366 or 370), 354*, 375*</td>
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<td>BAEN 480 (1-5)</td>
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<tr>
<td>ENGR 482 (2-2)</td>
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<td>U3 or U4</td>
<td></td>
<td>BAEN Elect.</td>
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</tr>
<tr>
<td>BAEN Elect.</td>
<td>3</td>
<td></td>
<td></td>
<td>Tech. Elect.</td>
<td>3</td>
</tr>
<tr>
<td>ENGR Elect.</td>
<td>3</td>
<td></td>
<td></td>
<td>American Hist. El.</td>
<td>3</td>
</tr>
<tr>
<td>Soc. Sci. Elect.</td>
<td>3</td>
<td></td>
<td></td>
<td>Creative Arts Elect.</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

* May Co-Register

| * May Co-Register |

ICD:

Notes: Grade Requirement: A grade of C or better is required for all courses in engineering, math, and science.
1. To be selected from the University Core Curriculum.
2. The 6 hours of international and cultural diversity courses, as required for graduation, may be met in the curriculum. Students may select Social and Behavioral Sciences, Creative Arts, or American History Electives that also meet the ICD requirement.
3. To be selected from departmental list of approved electives.

Total Degree Hours 127
Table 1-3. Recommended Electives for Each BAEN Emphasis Area.

<table>
<thead>
<tr>
<th>Environmental and Natural Resources Engineering Emphasis</th>
<th>Food and Bioprocess Engineering Emphasis</th>
<th>Machine Systems Engineering Emphasis</th>
<th>Renewable Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN 302</td>
<td>CVEN 357</td>
<td>MEEN 357</td>
<td>CVEN 302</td>
</tr>
<tr>
<td>MATH 417</td>
<td>CVEN 302</td>
<td>MEEN 357</td>
<td>MEEN 357</td>
</tr>
<tr>
<td>Math Electives</td>
<td>Select 3 hours of mathematics electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVEN 357</td>
<td>CVEN 302</td>
<td>MEEN 357</td>
<td></td>
</tr>
<tr>
<td>STAT 211</td>
<td>CVEN 302</td>
<td>MEEN 357</td>
<td></td>
</tr>
<tr>
<td>Technical Electives</td>
<td>Select 0-3 hours of science or engineering electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BESC 401</td>
<td>ESSM 440</td>
<td>ENDG 407</td>
<td>BESC 357</td>
</tr>
<tr>
<td>BESC 402</td>
<td>ESSM 351</td>
<td>ENDG 408</td>
<td>ESSM 351</td>
</tr>
<tr>
<td>BESC 403</td>
<td>GEOG 400</td>
<td>SCSC 301</td>
<td>GEOG 390</td>
</tr>
<tr>
<td>BIOL 357</td>
<td>GEOG 475</td>
<td>SCSC 400</td>
<td>RENR 403</td>
</tr>
<tr>
<td>ESSM 320</td>
<td>GEOL 120</td>
<td>SCSC 445</td>
<td>SCSC 425</td>
</tr>
<tr>
<td>ESSM 420</td>
<td>GEOL 410</td>
<td>GENE 301</td>
<td></td>
</tr>
<tr>
<td>ESSM 430</td>
<td>GEOL 451</td>
<td>FSTC - any 300 or 400 level course</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>except FSTC 315</td>
<td></td>
</tr>
<tr>
<td>Biological and Agricultural Engineering Electives</td>
<td>Select 6-12 hours from 400 level Biological and Agricultural Engineering courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 460</td>
<td>BAEN 468</td>
<td>BAEN 477</td>
<td>BAEN 414</td>
</tr>
<tr>
<td>BAEN 464</td>
<td>BAEN 469</td>
<td>BAEN 471</td>
<td>BAEN 471</td>
</tr>
<tr>
<td>BAEN 465</td>
<td>BAEN 471</td>
<td>BAEN 471</td>
<td></td>
</tr>
<tr>
<td>Engineering Electives</td>
<td>Select 0-3 hours from 300 or 400 level engineering courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVEN 301</td>
<td>CVEN 349</td>
<td>SENG 312</td>
<td>MEEN 340</td>
</tr>
<tr>
<td>CVEN 303</td>
<td>CVEN 351</td>
<td>SENG 321</td>
<td>MEEN 342</td>
</tr>
<tr>
<td>CVEN 333</td>
<td>CVEN 406</td>
<td>SENG 310</td>
<td>MEEN 363</td>
</tr>
<tr>
<td>CVEN 339</td>
<td>CVEN 413</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Technical electives and Engineering electives outside of the BAEN department might require prerequisites that we will not use towards your degree program in BAEN. You must check the prerequisites and ensure they are met if you plan to take specific courses.
D. Transfer Students and Transfer Courses

The minimum requirement for transfer students seeking admission to TAMU is a grade point ratio (GPR) of 2.5/4.00 on 24 graded hours of transferable courses. For transfer admission into BAEN, students should complete appropriate course work listed in Transfer Course Sheet provided by admissions at: (http://admissions.tamu.edu/admissions-staging/files/0d/0dd5b2ba-3768-4698-9472-ac79d33b47f0.pdf) which includes calculus, engineering chemistry, engineering physics.

The Office of Admissions determines whether transfer applicants meet minimum requirements to transfer to TAMU. For those who do, transfer application packets are routed to the college and department offering the prospective student’s major of choice. In addition to meeting minimum university requirements, students seeking admission into BAEN must complete a minimum of 12 SCH of math/science courses with grades not less than “B”, earned a GPR of 2.75 or higher, have no history of repeating, dropping or withdrawing from courses and no grade less than “C” in any course during the last semester of work. Numbers of transfer students accepted into BAEN for the past five years are summarized in Table 1-4.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Number of Transfer Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2011</td>
<td>12</td>
</tr>
<tr>
<td>2011-2012</td>
<td>5</td>
</tr>
<tr>
<td>2012-2013</td>
<td>16</td>
</tr>
<tr>
<td>2013-2014</td>
<td>5</td>
</tr>
<tr>
<td>2014-2015</td>
<td>12</td>
</tr>
</tbody>
</table>

Texas A&M transfer credit policy is published annually in the undergraduate catalog (pages 63-67, Ed. 137, http://catalog.tamu.edu/pdfs/14-15_UG_Catalog.pdf) and in Texas A&M University Student Rules (http://student-rules.tamu.edu/rule09). Generally, transfer credit evaluation falls into four categories: courses listed in the Texas Common Course Numbering System, equivalent courses taken at other institutions, distance and correspondence courses, and course credit earned by examination.

**Texas Common Course Numbering System**—The Texas Common Course Numbering System is supported by a collaboration of over 100 Texas community colleges and universities and is intended to facilitate transfer of general education courses at the freshman and sophomore levels. Courses taken at one participating system institution will transfer to another system institution based on established course equivalency guidelines. A listing of TAMU courses coordinated with the Texas Common Course Numbering System and their system equivalents is provided in the undergraduate catalog (pages 994-999, Ed. 137, http://catalog.tamu.edu/pdfs/14-15_UG_Catalog.pdf).

**Equivalent Courses Taken at Other Institutions**—The Office of Admissions takes primary responsibility for evaluating equivalency of courses taken at other institutions. Courses for which transfer credit is requested must be applicable to a degree offered at TAMU, be similar to a course offered for degree credit, and have content at or above the beginning-most course offered in that subject at TAMU. The Office of Admissions evaluates equivalency of course content using the catalog description and/or the course syllabus. If the Office of Admissions cannot
determine equivalency of a transfer course, the department offering similar subject matter at TAMU is asked to determine equivalency. The Transfer Course Equivalency website contains a searchable database of course equivalencies/evaluations for U.S. colleges and universities and can be found at https://compass-ssb.tamu.edu/pls/PROD/bwxkwtes.P_TransEquivMain.

In general, transfer credit is given for courses successfully completed at accredited institutions. Credit may be given for courses taken at non-accredited institutions if the student maintains at least a 2.00/4.00 GPR for his or her first 30 hours of course work completed at TAMU. Courses from international institutions are evaluated by the Office of Admissions on a case-by-case basis. For students in the Dwight Look College of Engineering and the College of Agriculture and Life Sciences, transfer credit for courses at the junior and senior level may be used toward degree requirements only with approval of the department head and dean. For BAEN students, the Advising Coordinator evaluates transfer of upper-division credit and makes recommendations regarding such approval.

**Distance and Correspondence Courses**—TAMU students may apply up to 30 credit hours of distance education including up to 12 hours of correspondence credit from accredited institutions towards degree requirements. Transfer of credit earned via distance or correspondence credit is subject to the same rules as equivalent courses taken at other institutions.

**Course Credit Earned by Examination**—Students receiving course credit by examination at another institution may transfer that credit to TAMU if they have successfully completed sequential course work in the same subject or if the credit is part of the student’s degree plan at the other institution. All credit earned by examination must conform to the requirements for regular courses taken at other institutions.

**E. Graduation Requirements**

Graduation requirements for the B.S. in BAEN are completion of 127 credit hours in the curriculum with a cumulative grade point ratio (GPR) of at least 2.00 over all courses taken at TAMU, a GPR of at least 2.00 for courses taken in the major (all BAEN courses) and grades of C or better in all math, science and engineering courses.

Student progress towards graduation is monitored at three different levels: by the student’s faculty advisor, by the department’s Advising Coordinator and Academic Advisor, and by the Office of Admissions. As previously mentioned, all BAEN students are blocked from registration until they have seen their faculty advisor. During this advising session, faculty advisors check student progress towards completion of degree requirements and work with the student to select appropriate courses for the next academic term. Faculty advisors update student progress on the curriculum check sheet (Table 1-2.).

In 2011, Texas Lawmakers passed HB 3025 which requires students to file a degree plan with institutions of higher education no later than the end of the second regular semester or term, beginning with students who enrolled in 2013. The degree plan details how and when they intend to achieve their degree. Texas A&M created an on-line degree planner which requires the students to enter their full degree plan by semester. This plan is sent to the Academic Advisor for approval. Additionally, student degree evaluations are automatically maintained in Compass (student information system) based on a template provided by each major. Each student has continuous access to his or her degree evaluation via the web through the Howdy portal.
As a student nears graduation, his or her progress toward meeting degree requirements is very closely monitored by the department’s Advising Coordinator and Academic Advisor. A degree evaluation is completed for each senior enrolled in BAEN 479 Biological and Agricultural Engineering Design I. These degree evaluations include a listing of all courses and other degree requirements remaining. These lists of remaining degree requirements are presented to students at the start of the semester to accommodate any required changes in course registration. The Advising Coordinator and Academic Advisor complete additional degree evaluations for students as they enter their last semester before graduation.

The final assessment of completion of degree requirements is provided by the Office of Admissions during the student’s final semester before graduation. The Office of Admissions completes a degree evaluation for each graduating senior to ensure completion of degree requirements. Any discrepancies are reported to the Advising Coordinator and Academic Advisor.

F. Enrollment and Graduation Trends

Enrollment, graduation trends and graduate placement trends for the past five years are shown in Tables 1-5 and 1-6. Undergraduate enrollment has grown considerably, increasing by 40% since 2010. The number of graduates from the program has ranged between 25 and 40 annually over this time period, but also is on the rise.

Table 1-5. Enrollment Trends for Past Five Academic Years

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time Students</td>
<td>160</td>
<td>190</td>
<td>215</td>
<td>217</td>
<td>223</td>
</tr>
<tr>
<td>Part-time Students</td>
<td>13</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Graduates</td>
<td>24</td>
<td>28</td>
<td>39</td>
<td>31</td>
<td>35</td>
</tr>
<tr>
<td>Numerical Identifier</td>
<td>Year Matriculated</td>
<td>Year Graduated</td>
<td>Initial or Current Employment/Job Title/Other Placement</td>
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<td></td>
</tr>
<tr>
<td>----------------------</td>
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<td>-----------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2010</td>
<td>2014</td>
<td>IDS Engineering/Design Engineer</td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>2010</td>
<td>2014</td>
<td>MS BAEN/TAMU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2010</td>
<td>2014</td>
<td>No employment at this time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2010</td>
<td>2014</td>
<td>No employment at this time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2010</td>
<td>2014</td>
<td>Jones and Carter/Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2010</td>
<td>2014</td>
<td>Sam Jackson Inc./Intern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2010</td>
<td>2014</td>
<td>MS BAEN/TAMU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2010</td>
<td>2014</td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2010</td>
<td>2014</td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2008</td>
<td>2014</td>
<td>Peace Corps</td>
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</tr>
<tr>
<td>11</td>
<td>2010</td>
<td>2014</td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2010</td>
<td>2014</td>
<td>MEN BAEN/TAMU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2009</td>
<td>2014</td>
<td>No information</td>
<td></td>
<td></td>
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<tr>
<td>14</td>
<td>2010</td>
<td>2014</td>
<td>HEB/Facilities Maintenance Engineer</td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td>2010</td>
<td>2014</td>
<td>Pape Dawson Engineering, Inc./Engineer 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>2010</td>
<td>2014</td>
<td>PhD BAEN/KState</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>2009</td>
<td>2014</td>
<td>Bleyl and Associates/Graduate Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>2009</td>
<td>2014</td>
<td>Vanderlinde Farm/Farm Hand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>2009</td>
<td>2014</td>
<td>BS PSSC/Post Bac. TAMU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2009</td>
<td>2014</td>
<td>National Oilwell Varco/DSE Momentum Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>2008</td>
<td>2014</td>
<td>Recreational Facilities and Services Professional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>2009</td>
<td>2014</td>
<td>Warrior Energy Services/Field Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>2009</td>
<td>2014</td>
<td>Schneider Electric/Proposal Specialist</td>
<td></td>
<td></td>
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<tr>
<td>24</td>
<td>2010</td>
<td>2014</td>
<td>Caterpillar Oil and Gas/Marketing Tech. Representative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>2009</td>
<td>2014</td>
<td>Pharm.D/University of AK for Medical Sciences</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(NOTE: ABET recognizes that current information may not be available for all students)
CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

The Department of Biological and Agricultural Engineering prepares our society to protect and sustain the environment, improve health, and feed the world through innovative education, research, and extension programs in Machine and Energy Systems, Food and Bioprocessing, and Environment and Natural Resources. The department strategic goals within the context of this mission are to

- Enhance graduate employability
- Develop and implement emerging technologies in food and agricultural applications.
- Prepare versatile, resilient, and globally globally-competent graduates.
- Expand instructional diversity while maintaining high standards of excellence.
- Expand multidisciplinary and integrated research and outreach programs
- Expand current and develop new revenue sources.
- Regain and expand capacity to meet growing extension education and lifelong learning needs.

To meet the needs of the industries we serve, we have established two undergraduate programs within the department: Biological and Agricultural Engineering and Agricultural Systems Management. The BAEN curriculum is designed to meet the needs of students with career interests in engineering.

University Mission—Texas A&M University developed a long-term vision and mission of becoming a top-ten university by the year 2020 (Vision 2020 Creating a Culture of Excellence, http://vision2020.tamu.edu/visioning-process-reports/V2020CultureExcellence.pdf) and through that vision completed the TAMU Academic Master Plan, the strategic plan to achieve key aspects of Vision 2020 (http://provost.tamu.edu/initiatives/academic-master-plan). The Academic Master Plan is composed of three roadmaps: teaching-learning, research, and engagement. The teaching-learning roadmap has established the following recommended student learning outcomes for all baccalaureate programs:

- Master the depth of knowledge required for a degree.
- Demonstrate critical thinking.
- Communicate effectively.
- Practice personal and social responsibility.
- Demonstrate social, cultural, and global competence.
- Prepare to engage in lifelong learning.
- Work collaboratively.

Dwight Look College of Engineering Vision and Mission—The vision and mission statements of the Dwight Look College of Engineering (http://engineering.tamu.edu/strategicplan/vision-mission) are given below:

Vision: To be recognized as a national and international educational leader in engineering and technology, by the public, our peers, and our profession.
Mission: Consistent with the historical responsibility of a land-grant university system, the educational mission of the Dwight Look College of Engineering is:

- To nurture and graduate students ready for professional practice
- To create, develop, and disseminate new knowledge and technologies
- To apply the results of the discovery process in order to enrich our undergraduate education programs, as well as to promote technology transfer and outreach activities.
- To inspire students who can apply the knowledge to solve problems, foster entrepreneurship and provide leadership for the benefit of the citizens and economy of Texas, the nation and the world.

College of Agriculture and Life Sciences Mission—The mission of the College of Agriculture and Life Sciences is to foster a stimulating educational environment that expands knowledge through discovery research and engages students in innovative learning experiences which empower them to serve and lead in our increasingly global society.

B. Program Educational Objectives

The overall educational goal of the BAEN program at TAMU is to graduate engineers that will fulfill the needs of industries we serve and advance our reputation as a world leader in engineering education. Specific educational objectives are as follows (p. 345-346 Ed. 137, http://catalog.tamu.edu/pdfs/14-15_UG_Catalog.pdf; http://baen.tamu.edu/academics/undergraduates/baen-curriculum/):

1. produce graduates who are prepared to become practicing biological and agricultural engineers, many of whom will become registered professional engineers;
2. produce graduates to serve the engineering needs of clientele in environmental and natural resources, machine systems, food processing, bioprocessing, and agricultural production and processing;
3. produce graduates who continue to be engaged in professional development.

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

Our departmental mission and the BAEN program educational objectives align well with the published missions for the university and both colleges. Program outcomes for the BAEN undergraduate program incorporate the recommended student learning outcomes in the university teaching-learning roadmap. Both colleges aim to maintain a high and well-recognized standard of excellence in education, professionalism, and discovery. The BAEN educational objectives match these overarching goals well. Finally, the BAEN educational objectives align with ABET criteria as indicated in Table 2-1.
Table 2-1. BAEN Educational Objectives Mapped to ABET Program Outcomes a-k.

<table>
<thead>
<tr>
<th>ABET Program Outcome</th>
<th>BAEN Educational Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. an ability to apply knowledge of mathematics, science and engineering</td>
<td>1 □ 2 □ 3</td>
</tr>
<tr>
<td>b. an ability to design and conduct experiments, as well as to analyze and interpret data</td>
<td>1 □ 2 □</td>
</tr>
<tr>
<td>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</td>
<td>1 □ 2 □</td>
</tr>
<tr>
<td>d. an ability to function on multidisciplinary teams</td>
<td>1 □ 2 □ 3</td>
</tr>
<tr>
<td>e. an ability to identify, formulate, and solve engineering problems</td>
<td>1 □ 2 □</td>
</tr>
<tr>
<td>f. an understanding of professional and ethical responsibility</td>
<td>1 □ 2 □ 3</td>
</tr>
<tr>
<td>g. an ability to communicate effectively</td>
<td>1 □ 2 □ 3</td>
</tr>
<tr>
<td>h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
<td>1 □ 2 □ 3</td>
</tr>
<tr>
<td>i. a recognition of the need for, and an ability to engage in life-long learning</td>
<td>1 □ 2 □ 3</td>
</tr>
<tr>
<td>j. a knowledge of contemporary issues</td>
<td>1 □ 2 □</td>
</tr>
<tr>
<td>k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>1 □ 2 □ 3</td>
</tr>
</tbody>
</table>

D. Program Constituencies

Constituencies for the BAEN program include students, faculty, employers (industry, government, and academia), and alumni. Employers and alumni are represented on the BAEN External Advisory Committee (EAC) which covers the broad range of employers of our graduates (Table 2-2). The EAC provides the primary means of employer input into program evaluation and is a secondary source for input from alumni. The EAC, a standing departmental committee, meets semiannually, and a portion of each meeting is devoted to discussion of academic programs. Recommendations on proposed or recently implemented changes to educational objectives, program outcomes, and curricula are presented for discussion and feedback.

The Engineering Undergraduate Program Committee (EUPC) is comprised of faculty and students representing the various emphasis areas within the BAEN program. Approximately five faculty representing different technical areas serve on the EUPC along with two or three upper level students. EUPC members are intimately involved in curricular assessment, evaluation, and modification. The EUPC meets two to three times each semester to review and evaluate assessment data as they become available. The committee develops recommendations for changes based on assessment results and forwards these recommendations for discussion at faculty meetings.
<table>
<thead>
<tr>
<th>Name Position</th>
<th>Company</th>
<th>Term</th>
<th>TAMU Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashish Anand Principal Engineer</td>
<td>Frito-Lay, Inc.—R&amp;D Plano, Texas</td>
<td>2013- present</td>
<td>M.S. AGEN 2003</td>
</tr>
<tr>
<td>Robert V. Avant, Jr. Executive Director</td>
<td>Texas Food &amp; Fibers Commission Austin, Texas</td>
<td>2002-2006</td>
<td>M.S. AGEN, 1976</td>
</tr>
<tr>
<td>Brian Berry President/CEO</td>
<td>Med Tech Construction Rockwall, Texas</td>
<td>2013- present</td>
<td>B.S. AGSM, 1999</td>
</tr>
<tr>
<td>Timothy E. Buscha Sr. Project Engineer</td>
<td>Pate Engineers Houston, Texas</td>
<td>2008-2010</td>
<td>M.S. AGEN, 1992</td>
</tr>
<tr>
<td>Mike Dearing President</td>
<td>NOV Rolligon Anderson, Texas</td>
<td>2008-2010</td>
<td>B.S. AGEN, 1979</td>
</tr>
<tr>
<td>Chris Hundley Global Equipment Operations Lead</td>
<td>Monsanto Company Chesterfield, Missouri</td>
<td>2013- present</td>
<td>B.S. AGSM, 2000 M.S. AGRO, 2004</td>
</tr>
<tr>
<td>Richard Hyde, Director Air Permits Division</td>
<td>Texas Commission on Environmental Quality Austin, Texas</td>
<td>2006-2010</td>
<td>B.S. AGEN, 1991</td>
</tr>
<tr>
<td>Catherine Findley Nash Civil Engineer</td>
<td>USDA-NRS Temple, Texas</td>
<td>2005-2007</td>
<td>B.S. AGEN, 1993</td>
</tr>
<tr>
<td>Charles A. Onstad Area Director</td>
<td>USDA-ARS College Station, Texas</td>
<td>2002-2006</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Position</td>
<td>Company</td>
<td>Term</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------</td>
<td>----------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Sheyla Ramsay</td>
<td>Senior Project Engineer</td>
<td>Frito-Lay, Inc. Plano, Texas</td>
<td>2004-2010</td>
</tr>
<tr>
<td>Anna M. Rodriguez</td>
<td>Environmental Specialist</td>
<td>Texas Commission on Environmental Quality, Austin, Texas</td>
<td>2002-2006</td>
</tr>
<tr>
<td>Gregory E. Rothe</td>
<td>General Manager</td>
<td>San Antonio River Authority San Antonio, Texas</td>
<td>2002-2004</td>
</tr>
<tr>
<td>Mike Snow, Vice President</td>
<td>Industrial Management</td>
<td>Bunge North America St. Louis, Missouri</td>
<td>2013-present</td>
</tr>
<tr>
<td>Steve Stuchly</td>
<td>Manager Global Business</td>
<td>Halliburton Houston, Texas</td>
<td>2013-present</td>
</tr>
<tr>
<td>K.C. Ting</td>
<td>Professor and Head</td>
<td>Agricultural &amp; Biological Engineering University of Illinois, Urbana, Illinois</td>
<td>2008-2010</td>
</tr>
<tr>
<td>Michael Topor</td>
<td>Senior Research Consultant</td>
<td>Frito-Lay Technology Dallas, Texas</td>
<td>2002-2004</td>
</tr>
<tr>
<td>Brahm Verma</td>
<td>Professor and Head</td>
<td>Biological &amp; Agricultural Engineering Dept., University of Georgia Athens, Georgia</td>
<td>2005-2007</td>
</tr>
<tr>
<td>Steve Walthour</td>
<td>General Manager</td>
<td>North Plains Groundwater Conservation District, Dumas, Texas</td>
<td>2013-present</td>
</tr>
<tr>
<td>Benjamin T. Weinheimer</td>
<td>Regulatory Manager</td>
<td>Texas Cattle Feeders Association Amarillo, Texas</td>
<td>2003-2005</td>
</tr>
<tr>
<td>W.E. Bill West, Jr.</td>
<td>General Manager</td>
<td>Guadalupe-Blanco River Authority Seguin, Texas</td>
<td>2013-present</td>
</tr>
<tr>
<td>Linda M. Williams</td>
<td>Leader Senior Air Quality Team</td>
<td>URS Houston, Texas</td>
<td>2013-present</td>
</tr>
</tbody>
</table>
E. Process for Establishing Program Educational Objectives

The current educational objectives were formalized prior to the 2010 ABET general review and are reviewed by the EUPC every three years. During the review, consideration is given to both internal factors such as major changes in the program or curriculum and external factors such as changes to ABET criteria. Any revisions needed are drafted by the EUPC and presented to the full faculty at a regularly scheduled faculty meeting. Once changes are approved by the faculty, they are presented to the EAC for discussion and input. Any changes to the educational objectives that are approved are posted to the departmental web site and submitted for publication in the next edition of the TAMU undergraduate catalog.

The program objectives were reviewed by the EUPC on June 20, 2013 with no changes made. The program objectives were reaffirmed by the full faculty in September, 2013. The EAC reviewed and reaffirmed the program objectives on October 31, 2013. Review of the PEO’s are scheduled to occur again in 2016.
CRITERION 3. PROGRAM OUTCOMES

A. Process for Establishing and Revising Program Outcomes

The BAEN program outcomes were developed to provide graduates with the educational background needed to start their careers or pursue further programs of study. The process for establishing and revising program outcomes is similar to that for establishing and revising educational objectives. Program outcomes were established prior to the 2010 ABET general review and have been modified slightly since then. The program objectives are reviewed every three years. Initial review is performed by the Engineering Undergraduate Program Committee (EUPC); and if any revisions are recommended, they are brought to a regular faculty meeting for discussion and approval. Revisions to the program outcomes also are presented to the External Advisory Committee (EAC) for discussion and input. Approved program outcomes are published on the departmental web site (http://baen.tamu.edu/academics/undergraduates/baen-curriculum/).

B. Program Outcomes

Program outcomes for the BAEN program were developed based on ABET Criterion 3 and have a one-to-one correspondence with ABET outcomes a-k. Outcomes for the BAEN program are documented on the BAEN web site (http://baen.tamu.edu/academics/undergraduates/baen-curriculum/) and state that graduates will have

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.

C. Relationship of Program Outcomes to Program Educational Objectives

The relationship between BAEN program outcomes and educational objectives is shown in Table 3-1. Although we have assigned subsets of our program outcomes as being particularly relevant to each of our educational objectives, essentially all program outcomes should be achieved to produce well-rounded, technically competent graduates who will meet all three educational objectives.
Table 3-1. Relationship of BAEN Outcomes to BAEN Educational Objectives.

<table>
<thead>
<tr>
<th>BAEN Educational Objective</th>
<th>Relevant Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Produce graduates who are prepared to become practicing biological and agricultural engineers, many of whom will become registered professional engineers</td>
<td>a, b, c, d, e, f, g, h, i, k</td>
</tr>
<tr>
<td>2 Produce graduates to serve the engineering needs of clientele in environmental and natural resources, machine systems, food processing, bioprocessing, and agricultural production and processing</td>
<td>a, b, c, d, e, f, g, h, i, k</td>
</tr>
<tr>
<td>3 Produce graduates who continue to be engaged in professional development</td>
<td>d, f, g, h, i, j, k</td>
</tr>
</tbody>
</table>

D. Relationship of Courses in the Curriculum to the Program Outcomes

Courses in the BAEN curriculum have been selected to give students an appropriate background in math, science, engineering, communication, and the broad education necessary to become successful engineers. The basic math and science courses in the curriculum address primarily outcomes a and e. Required English and communications courses address outcome g, and courses in political science, history, international and cultural diversity, social and behavioral sciences and visual and performing arts generally address outcomes h and j. A more detailed analysis of the relationship between engineering science and departmental courses and program outcomes is provided in Table 3-2.

Table 3-2. Coverage of BAEN Educational Outcomes a-k in Engineering Science, Departmental Required and Departmental Elective Courses.

<table>
<thead>
<tr>
<th>Outcome:</th>
<th>Level of Coverage</th>
<th>Outcome:</th>
<th>Level of Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Science Courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 111 Foundations of Engineering I</td>
<td>3 3 3 3 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 112 Foundations of Engineering II</td>
<td>3 3 3 3 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEEN 221 Statics and Particle Dynamics</td>
<td>3 3 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEEN 222 Materials Science</td>
<td>3 2 1 3 2 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVEN 305 Mechanics of Materials</td>
<td>3 3 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECEN 215 Principles of Electrical Engr</td>
<td>3 3 2 3 3 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required BAEN Courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 150 Intro to Bio and Ag Engr Design</td>
<td>3 2 2 1 3 1 2 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 301 Bio and Ag Engr Fundamentals I</td>
<td>3 3 3 1 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 302 Bio and Ag Engr Fundamentals II</td>
<td>3 3 1 3 3 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 320 Engineering Thermodynamics</td>
<td>3 3 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 340 Fluid Mechanics</td>
<td>3 3 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 354 Engr Prop of Biol Mat</td>
<td>3 3 2 2 3 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 365 Unit Ops for Bio and Ag Engr</td>
<td>3 2 2 1 3 2 1 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 366 Trans Proc in Biol Sys</td>
<td>3 3 3 3 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 370 Control of Bio Sys and Ag Processes</td>
<td>3 1 3 2 3 2 1 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 375 Des of Ag Mach and Structures</td>
<td>3 3 3 1 3 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 479 Biol and Ag Engr Design I</td>
<td>3 2 2 2 2 2 2 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Level 1</td>
<td>Level 2</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>BAEN 480</td>
<td>Biol and Ag Engr Design II</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>BAEN Elective Courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAEN 412</td>
<td>Hydraulic Power</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 414</td>
<td>Renewable Energy Conversions</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 417</td>
<td>Nanoscale Biological Engineering</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 422</td>
<td>Unit Oper in Food Proc</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BAEN 427</td>
<td>Engr Aspects of Packaging</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 460</td>
<td>Prin Environmental Hydrology</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 464</td>
<td>Irrig and Drain Engr</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 465</td>
<td>Design of Biol Waste Treat Sys</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BAEN 468</td>
<td>Soil and Water Consv Engr</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BAEN 469</td>
<td>Water Quality Engr</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>BAEN 471</td>
<td>Intro to Biochemical Engr</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 477</td>
<td>Air Pollution Engr</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BAEN 489</td>
<td>Fund of Ecological Engineering</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BAEN 489 Intro to Bioseparations</td>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

1 Level of coverage in course materials and assignments: 1 = briefly covered, not reflected in the course grade; 2 = moderately well covered, represents a minor portion of the course grade (up to 25%); 3 = covered in detail, represents a significant portion of the course grade (over 25%).

2 Coverage of outcomes b and k in BAEN 479/480 is dependent on the specific design project.

F. Achievement of Program Outcomes

Assessment Tools and Processes—Assessment procedures for the BAEN program include data from six sources:

- Student performance on assignments in key required courses as assessed by faculty or outside cooperators from industry and government,
- Fundamentals of Engineering exam results,
- Graduating senior surveys,
- Alumni surveys,
- Employer surveys,
- Student performance in key required courses, and
- Completion of university core curriculum requirements.

Our use of these assessment vehicles, including specific metrics used to gage success in achieving outcomes, is summarized in Table 3-3. As indicated in Table 3-3, at least three assessment data sources were used to evaluate achievement of success for each of our educational outcomes. While survey data are used as a source of assessment data, they are not the sole source of data for any of our educational outcomes. A description of each assessment process and the data collected are described following the table and an analysis of student performance with respect to each outcome is presented.

Table 3-3. Metrics and Assessment Methods for BAEN Program Outcomes.

<table>
<thead>
<tr>
<th>Metrics for Program Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. An ability to apply knowledge of mathematics, science and engineering.</td>
<td></td>
</tr>
</tbody>
</table>
### Metrics for Program Outcomes

| Students will achieve a grade of C or better in all required engineering courses (ENGR 111, ENGR 112, MEEN 221, 222; CVEN 305; ECEN 215; BAEN 301, 302, 320, 340, 354, 365, 366, 370, 375, 479, 480) | Assessment Methods | Student performance in key required courses |
| Students will achieve a ranking of 3.5 or higher for appropriate use of engineering analysis in developing final design for capstone design project (BAEN 480) as rated by a panel of industry cooperators and faculty. | Assessment Methods | Student performance on assignments in key required courses |
| Students taking the FE exam will achieve an average percent passing equal to or exceeding the average for the ABET comparator group. | Assessment Methods | Fundamentals of Engineering exam results |
| Students taking the FE exam will have an average percent correct in each subject area at least as high as the average for the ABET comparator group. | Assessment Methods | Fundamentals of Engineering exam results |
| Students express confidence in ability to apply math, science, and engineering principles as indicated by an average response to questions on the senior survey related to outcome a of at least 3.75 using a Likert scale of 1-5. | Assessment Methods | Graduating senior survey |
| Graduates indicate their undergraduate education prepared them to apply math, science, and engineering principles by giving an average response to questions on the former student survey related to outcome a of at least 3.75 using a Likert scale of 1-5. | Assessment Methods | BAEN alumni survey |
| Employers of BAEN graduates indicate those employees were prepared to apply math, science, and engineering principles by giving an average response to questions on the employer survey related to outcome a of at least 3.75 using a Likert scale of 1-5. | Assessment Methods | BAEN employer survey |
| b. An ability to design and conduct experiments, as well as to analyze and interpret data. | Assessment Methods | Graduating senior survey |
| Students will achieve a grade of C or better on the laboratory components of BAEN 301, 302, 354, 365, 370 as rated by faculty. | Assessment Methods | Student performance on assignments in key required courses |
| Students express confidence in ability to collect and analyze data as indicated by an average response to questions on the senior survey related to outcome b of at least 3.75 using a Likert scale of 1-5. | Assessment Methods | Graduating senior survey |
| Graduates indicate their undergraduate education prepared them to collect and analyze data by giving an average response to questions on the former student survey related to outcome b of at least 3.75 using a Likert scale of 1-5. | Assessment Methods | BAEN alumni survey |
| Employers of BAEN graduates indicate those employees were prepared to collect and analyze data by giving an average response to questions on the employer survey related to outcome b of at least 3.75 using a Likert scale of 1-5. | Assessment Methods | BAEN employer survey |
| 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. | Assessment Methods | |


<table>
<thead>
<tr>
<th>Metrics for Program Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual grades for design components of BAEN 370 and 375 as rated by instructor will be at least a C.</td>
<td>Student performance on assignments in key required courses</td>
</tr>
<tr>
<td>Students will achieve a rating of at least 3.5 on the design component of the capstone design project (BAEN 480) as rated by a panel of industry cooperators and faculty.</td>
<td>Student performance on assignments in key required courses</td>
</tr>
<tr>
<td>Students express confidence in ability to design systems, components or processes as indicated by an average response to questions on the senior survey related to outcome c of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to design systems, components or processes by giving an average response to questions on the former student survey related to outcome c of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees were prepared to design systems, components or processes by giving an average response to questions on the employer survey related to outcome c of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
<tr>
<td><strong>d. An ability to function on multidisciplinary teams.</strong></td>
<td></td>
</tr>
<tr>
<td>Students demonstrate ability to work effectively on teams in BAEN 150 and 479/480. Students will achieve an average rating of 3.5 from peer and faculty evaluations using a Likert scale of 1-5.</td>
<td>Student performance in key required courses</td>
</tr>
<tr>
<td>Students express confidence in being able to work effectively on teams as indicated by an average response to questions on the senior survey related to outcome d of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to work on teams by giving an average response to questions on the former student survey related to outcome d of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees were prepared to work on teams by giving an average response to questions on the employer survey related to outcome d of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
<tr>
<td>Metrics for Program Outcomes</td>
<td>Assessment Methods</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td><strong>e. An ability to identify, formulate, and solve engineering problems.</strong></td>
<td></td>
</tr>
<tr>
<td>Students are able to develop competent and complete solutions to comprehensive engineering problems as indicated by achieving a grade of at least a C in BAEN 320, 340, 354, 365, 366, 370, 375, 480.</td>
<td>Student performance in key required courses</td>
</tr>
<tr>
<td>Students will achieve a rating of at least 3.5 on the design component of the capstone design project (BAEN 480) as rated by a panel of industry cooperators and faculty.</td>
<td>Student performance on assignments in key required courses</td>
</tr>
<tr>
<td>Students taking the FE exam will achieve an average percent passing equal to or exceeding the average for the ABET comparator group.</td>
<td>Fundamentals of Engineering exam results</td>
</tr>
<tr>
<td>Students express confidence in their own problem solving abilities by having an average response to questions on the senior survey relating to outcome e of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to apply problem-solving skills on the job by giving an average response to questions on the former student survey relating to outcome e of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees were prepared to apply problem-solving skills by giving an average response to questions on the employer survey related to outcome e of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
<tr>
<td><strong>f. An understanding of professional and ethical responsibility.</strong></td>
<td></td>
</tr>
<tr>
<td>Students will have an average percent correct on 70% of the questions on the final that meets or exceeds the class average percent correct. Students will achieve a grade of C or better in ENGR 482 Ethics and Engineering or equivalent course.</td>
<td>Student performance in key required courses</td>
</tr>
<tr>
<td>Students taking the FE exam will have an average percent correct for the Ethics questions at least as high as the average for the ABET comparator group.</td>
<td>Fundamentals of Engineering exam results</td>
</tr>
<tr>
<td>Students express an appreciation for professional and ethical responsibility by having an average response to questions on the senior survey relating to outcome f of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to know professional and ethical responsibilities by giving an average response to questions on the former student survey relating to outcome f of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees understand professional and ethical responsibilities by giving an average response to questions on the employer survey related to outcome f of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
<tr>
<td>Metrics for Program Outcomes</td>
<td>Assessment Methods</td>
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</tr>
<tr>
<td>g. An ability to communicate effectively.</td>
<td></td>
</tr>
<tr>
<td>Students will achieve a grade of C or better on the communication components of BAEN 301, 302, 479, 480.</td>
<td>Student performance on assignments in key required courses as rated by faculty</td>
</tr>
<tr>
<td>Students express confidence in their ability to communicate effectively by having an average response to questions on the senior survey relating to outcome g of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to communicate effectively on the job by giving an average response to questions on the former student survey relating to outcome g of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees were prepared to communicate effectively by giving an average response to questions on the employer survey related to outcome g of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
<tr>
<td>h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</td>
<td></td>
</tr>
<tr>
<td>Students identify appropriate design constraints that that incorporate global, economic, environmental and societal concerns in completing their design project for BAEN 479, 480. Faculty and client ratings of student performance will be at least 3.5.</td>
<td>Student performance on assignments in key required courses as rated by faculty and industry cooperators</td>
</tr>
<tr>
<td>Students express an understanding of the impact of engineering solutions in global and societal context by having an average response to questions on the senior survey relating to outcome h of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to understand the impact of engineering solutions in a global, economic, environmental and societal context by giving an average response to questions on the former student survey relating to outcome h of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees understand the impact of engineering solutions in a global, economic, environmental and societal context by giving an average response to questions on the employer survey related to outcome h of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
<tr>
<td>Metrics for Program Outcomes</td>
<td>Assessment Methods</td>
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<tr>
<td>i. A recognition of the need for, and an ability to engage in life-long learning.</td>
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</tr>
<tr>
<td>Students will demonstrate an ability to use critical information resources such as the internet, library, technical journals, and patents in completing their design project for BAEN 480. Students will receive at least 3.5 on faculty and client ratings of performance.</td>
<td>Student performance on assignments in key required courses as rated by faculty and industry co-op employers.</td>
</tr>
<tr>
<td>Students express confidence in skills needed for lifelong learning as indicated by an average response to questions on the senior survey relating to outcome i of at least 3.75 using a Likert scale of 1-5.</td>
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<tr>
<td>At least 70% of graduates will indicate ongoing membership in one or more professional societies.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them for lifelong learning by giving an average response to questions on the former student survey relating to outcome i of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees were prepared for lifelong learning by giving an average response to questions on the employer survey related to outcome i of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
<tr>
<td>j. Knowledge of contemporary issues.</td>
<td></td>
</tr>
<tr>
<td>Students will participate in study abroad and/or international exchange programs. At least half of our graduates will have completed a study abroad program to another country or participated in an international student exchange program as selfreported on survey.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Students indicate understanding of contemporary issues as indicated by an average response to questions on the senior survey relating to outcome j of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to gain knowledge of contemporary issues by giving an average response to questions on the former student survey relating to outcome j of at least 3.75 using a Likert scale of 1-5.</td>
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<tr>
<td>Employers of BAEN graduates indicate those employees have knowledge of contemporary issues by giving an average response to questions on the employer survey related to outcome j of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
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</table>
k. **An ability to apply the techniques, skills, and engineering tools necessary for solving complex engineering problems.**

<table>
<thead>
<tr>
<th>Metrics for Program Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students exhibit an ability to use various software packages and other engineering tools for solving engineering problems. Faculty and client ratings of student use of appropriate engineering analysis and resources in the capstone design course (BAEN 480) will be at least 3.5.</td>
<td>Student performance on assignments in key required courses as rated by faculty and industry cooperators</td>
</tr>
<tr>
<td>Students express an ability to use modern engineering methods to solve complex engineering problems as indicated by an average response to questions on the senior survey relating to outcome k of at least 3.75 using a Likert scale of 1-5.</td>
<td>Graduating senior survey</td>
</tr>
<tr>
<td>Graduates indicate their undergraduate education prepared them to utilize new methods for solving problems by giving an average response to questions on the former student survey relating to outcome k of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN alumni survey</td>
</tr>
<tr>
<td>Employers of BAEN graduates indicate those employees were prepared to utilize new methods for solving problems by giving an average response to questions on the employer survey related to outcome k of at least 3.75 using a Likert scale of 1-5.</td>
<td>BAEN employer survey</td>
</tr>
</tbody>
</table>

**Student Performance on Assignments in Key Required Courses**—Student performance on specific assignments in the capstone courses (BAEN 479 and 480) is used to assess achievement of outcomes a, c, d, e, g, h, i, and k. Student performance is evaluated by a panel of faculty and individuals from industry or government, many of whom serve as clients for the design projects. Non-faculty individuals serving on the panels for the past six years are listed in Table 3-5. Each member of the panel rates student team performance on specific design characteristics. A summary of these ratings is provided in Table 3-6.

**Table 3-5. Individuals participating in panel review of student work on BAEN 480 capstone design projects.**

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</table>
Table 3-6. Industrial cooperator and faculty ratings of student performance on specific characteristics of capstone design projects.

<table>
<thead>
<tr>
<th>Design Characteristic&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Outcomes</th>
<th>2010-2011&lt;sup&gt;n = 27&lt;/sup&gt;</th>
<th>2011-2012&lt;sup&gt;n = 27&lt;/sup&gt;</th>
<th>2012-2013&lt;sup&gt;n = 17&lt;/sup&gt;</th>
<th>2013-2014&lt;sup&gt;n = 45&lt;/sup&gt;</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Avg</td>
<td>Min</td>
<td>Avg</td>
<td>Min</td>
</tr>
<tr>
<td>Design objectives were clearly formulated</td>
<td>e, e</td>
<td>4.26</td>
<td>2.0</td>
<td>4.3</td>
<td>2.0</td>
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<tr>
<td>Design constraints were clearly defined</td>
<td>e, e</td>
<td>4.16</td>
<td>2.0</td>
<td>4.2</td>
<td>3.0</td>
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<tr>
<td>Considered a reasonable number of alternate solutions and approaches</td>
<td>c</td>
<td>4.10</td>
<td>3.0</td>
<td>3.9</td>
<td>1.0</td>
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<tr>
<td>Final design was based on appropriate engineering analysis</td>
<td>a, k</td>
<td>4.09</td>
<td>2</td>
<td>3.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Adequate economic analysis was presented</td>
<td>c</td>
<td>NA&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3.8</td>
<td>2.0</td>
<td>4.5</td>
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<tr>
<td>Appropriate technical resources and references were used</td>
<td>i, k</td>
<td>4.23</td>
<td>3.0</td>
<td>3.7</td>
<td>1.0</td>
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<tr>
<td>Report professional and clearly communicated</td>
<td>g</td>
<td>4.45</td>
<td>3.0</td>
<td>4.2</td>
<td>3.0</td>
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</table>

<sup>1</sup>Students rated on a scale of 1 to 5 in each category. Students ranked by industrial cooperators and faculty present for final project presentation.

<sup>2</sup>Data were not available for the 2010-2011 academic year.
Student grades on specific assignments are collected from several other required courses to measure achievement of a number of BAEN educational outcomes. Our metric for success is that students will earn an average grade of C or better on the monitored assignments. For these assignments, faculty were responsible for grading. Table 3-7 provides average and minimum grades received by students on these assignments during the past five academic years.

### Table 3-7. Student performance on assignments in key required courses.

<table>
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<tr>
<th>Course/component</th>
<th>Outcome</th>
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<th>2011-2012</th>
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<th>2013-2014</th>
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<tr>
<td></td>
<td>(n)</td>
<td>Avg</td>
<td>Min</td>
<td>Avg</td>
<td>Min</td>
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<td>BAEN 150</td>
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<td>NA</td>
<td>NA</td>
<td>(77)</td>
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<td>97</td>
<td>70</td>
<td>(44)</td>
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<td>Communication</td>
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<td>85</td>
<td>60</td>
<td>(41)</td>
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<td>67</td>
<td>39</td>
<td>68</td>
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<td>(29)</td>
<td>80</td>
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<td></td>
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<td>g</td>
<td>75</td>
<td>21</td>
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<td>Design &amp; analysis</td>
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<td>(34)</td>
<td>87</td>
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<td>BAEN 370</td>
<td>Design &amp; analysis</td>
<td>b</td>
<td>(24)</td>
<td>89.6</td>
<td>76.7</td>
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<tr>
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<td>Design project</td>
<td>c,d</td>
<td>92</td>
<td>87</td>
<td>89.6</td>
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</table>

1Number of students taking the course
2Teamwork is rated using a scale of 1-5 and is the average of self, peer, and faculty ratings.
3Performance is given as percentage grade for indicated component.

**Fundamentals of Engineering Exam**—Statistical reports from the Fundamentals of Engineering exams have been used by the department for many years as a measure of program effectiveness, and we examine these data annually as part of our outcomes assessment process. Until 2014, the primary data used were from the National Council of Examiners for Engineering and Surveying (NCEES) subject matter reports by major based on afternoon exam selected for currently enrolled students. Most students in the department indicate a major of “Agricultural” on the exam and take the “General” afternoon exam; however, some of our students take the “Environmental” afternoon exam and some may indicate their major as “Biological not biomedical.” In 2014, the format of the exam changed to subject matter exams offered several times during the semester in a computerized format. “Agricultural” was dropped as a major choice so student’s select “Biological not biomedical”. Summaries for all students taking the exams are made available twice a year in June and January. In the first two cycles of the new format BAEN students took the “Other disciplines” or “Environmental
exams”. In the summary of results below, we have compiled data for all BAEN students who could be identified as such for comparison of the percentage passing and evaluation of performance by subject matter. We have chosen to compare the performance of our students to that for students in the ABET (Carnegie prior to 2014) comparator group of universities because we feel this is the highest available standard and want our students to be commensurate with this elite group.

Although the percentage of our graduates taking the exam varies from year to year, over the past six years approximately 70% or our graduates have taken the exam (Table 3-8). Because the number of our students taking the exam at any time is relatively small, the results for our students tend to fluctuate significantly from one exam to the next. To reduce this fluctuation so we can see more clearly any trends that are occurring, we use a two-year running average of the results (averages over four exams). Upon analyzing this data we noticed that over the past 4 years there has been a significant trend downwards in the % of our graduates taking the exam. We are in the process of investigating why this is occurring (for instance, is it related to the new format) and taking corrective measures.

<table>
<thead>
<tr>
<th>Table 3-8. Percentage of BAEN graduates taking FE exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduates</td>
</tr>
<tr>
<td>Students taking FE exam</td>
</tr>
<tr>
<td>Percentage of graduates taking FE exam</td>
</tr>
</tbody>
</table>

Although the percentage of students passing the exam does not provide much information on specific program outcomes, we feel it does provide some measure of a student’s ability to apply knowledge of math, science and engineering principles (outcome a) and to identify, formulate and solve engineering problems (outcome e). Comparison of the percentage of BAEN students passing the FE exam with the ABET/Carnegie comparator average is shown in Figure 3-1. Over the past six years, the average percent passing for our students was 86% compared to the ABET/Carnegie average of 80%, a significant increase over the previous ABET cycle.
Figure 3-1. Ratio of percentage of BAEN students passing the FE exam to the percentage of ABEN/Carnegie comparator group students passing. Data are two-year running averages.

We further analyzed data for the average percentage of questions answered correctly (until 2014) or the Institution Average Performance Index (after 2014) by subject matter category as provided in the NCEES report. Our target is for the BAEN average to be at least as high as the ABET/Carnegie comparator group average. Results for the last five years are shown in Figures 3-2 through 3-5. The subject matter areas for the “Environmental” exam vary quite a bit from the subject matter areas in the “Other disciplines” exam. Biology is no longer a subject on any of the FE exams. We have combined results for subject areas that are similar between the two exams, and again we have plotted two-year running averages of the results (averages over four exams) to more clearly observe trends.

We have generally been very close to or have exceeded the ABET/Carnegie average (our target metric) in all subject areas except chemistry and computers. Performance in these subject areas has gone down significantly with the institution of the new FE format, trends that are being investigated and addressed.
Figure 3-2. Comparison of BAEN students to ABET/Carnegie comparator students with respect to percent of questions answered correctly or Institution Average Performance Index in the subject areas of engineering mechanics (statics and dynamics), strength of materials, and material properties.

Figure 3-3. Comparison of BAEN students to ABET/Carnegie comparator group students with respect to percent of questions answered correctly or Institution Average Performance Index in the subject areas of fluid mechanics and thermodynamics and heat transfer.
Figure 3-4. Comparison of BAEN students to ABET/Carnegie comparator group students with respect to percent of questions answered correctly or Institution Average Performance Index in the subject areas of mathematics, engineering probability and statistics, chemistry, and computers.

Figure 3-5. Comparison of BAEN students to ABET/Carnegie comparator group students with respect to percent of questions answered correctly or Institution Average Performance Index in the subject areas of ethics and business practices, engineering economics, biology, and electricity and magnetism.
Senior Survey— The department head has conducted exit interviews with seniors for many years. Beginning in 2002, a more formal process to gather information from senior students was initiated. A survey was developed to gather information on students’ perceptions of their educational experience and preparation in our program. The department head also conducts focus group sessions with senior students to obtain open-ended input about the department’s educational programs outside the formal ABET assessment process. The survey contains two to five items relating to each program outcome arranged in random order. The items pertaining to each program outcome are given in Table 3-9. A copy of the senior survey will be provided on request.

### Table 3-9. Questions on BAEN Senior Survey

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Questions: My undergraduate education prepared me to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>• apply mathematics to engineering problems</td>
</tr>
<tr>
<td></td>
<td>• apply physical sciences (e.g., physics, chemistry) to engineering problems</td>
</tr>
<tr>
<td></td>
<td>• apply life sciences (e.g., biology, agricultural sciences) to engineering problems</td>
</tr>
<tr>
<td></td>
<td>• apply engineering science principles (e.g., statics, dynamics, fluid mechanics, thermodynamics) to engineering problems</td>
</tr>
<tr>
<td>b</td>
<td>• draw conclusions from analysis of experimental data</td>
</tr>
<tr>
<td></td>
<td>• conduct experiments to collect data</td>
</tr>
<tr>
<td></td>
<td>• analyze data gathered during experiments</td>
</tr>
<tr>
<td></td>
<td>• design experiments to collect experimental data</td>
</tr>
<tr>
<td>c</td>
<td>• develop alternative solutions for solving engineering problems</td>
</tr>
<tr>
<td></td>
<td>• identify design objectives and constraints</td>
</tr>
<tr>
<td></td>
<td>• identify the optimal design solution to a complex problem</td>
</tr>
<tr>
<td></td>
<td>• perform necessary analyses to test an engineering design</td>
</tr>
<tr>
<td></td>
<td>• incorporate constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability in engineering designs</td>
</tr>
<tr>
<td>d</td>
<td>• function as a team leader</td>
</tr>
<tr>
<td></td>
<td>• use differing talents of team members to enhance team productivity</td>
</tr>
<tr>
<td></td>
<td>• function on multidisciplinary teams</td>
</tr>
<tr>
<td></td>
<td>• resolve conflicts that arise in a team</td>
</tr>
<tr>
<td>e</td>
<td>• review work on engineering problems to identify mistakes</td>
</tr>
<tr>
<td></td>
<td>• solve engineering problems</td>
</tr>
<tr>
<td></td>
<td>• make sound assumptions in solving engineering problems</td>
</tr>
<tr>
<td></td>
<td>• integrate information from several disciplines to solve problems</td>
</tr>
<tr>
<td>f</td>
<td>• recognize situations in conflict with the Code of Ethics for Engineers</td>
</tr>
<tr>
<td></td>
<td>• pursue licensing as a professional engineer</td>
</tr>
<tr>
<td></td>
<td>• rectify situations of questionable ethics</td>
</tr>
<tr>
<td>g</td>
<td>• communicate in writing (e.g., technical reports, progress reports, business correspondence)</td>
</tr>
<tr>
<td></td>
<td>• use figures, tables, and other non-text means of communication in reports</td>
</tr>
<tr>
<td></td>
<td>• communicate effectively with non-engineers</td>
</tr>
<tr>
<td></td>
<td>• communicate orally (e.g., formal presentations, communications with colleagues)</td>
</tr>
<tr>
<td>h</td>
<td>• assess the impact of engineering solutions in an economic context</td>
</tr>
<tr>
<td></td>
<td>• assess the impact of engineering solutions in an environmental context</td>
</tr>
<tr>
<td></td>
<td>• analyze the costs of implementing a design (e.g., economic, environmental, social, political)</td>
</tr>
<tr>
<td></td>
<td>• assess the impact of engineering solutions on society</td>
</tr>
<tr>
<td>i</td>
<td>• search for information from a variety of sources (e.g., libraries, technical journals, internet)</td>
</tr>
<tr>
<td>Outcome</td>
<td>Questions: My undergraduate education prepared me to...</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>• perform background research necessary to complete an engineering design</td>
</tr>
<tr>
<td></td>
<td>• evaluate the quality of information found from various sources</td>
</tr>
<tr>
<td>j</td>
<td>• be cognizant of contemporary issues and how they impact engineering solutions</td>
</tr>
<tr>
<td></td>
<td>• appreciate differences of diverse clientele</td>
</tr>
<tr>
<td></td>
<td>• assess the impact of current issues on engineering practice</td>
</tr>
<tr>
<td>k</td>
<td>• use new technologies/methods to solve engineering problems</td>
</tr>
<tr>
<td></td>
<td>• use computing technology to enhance written or oral communications</td>
</tr>
<tr>
<td></td>
<td>• use appropriate computer software packages for solving engineering problems</td>
</tr>
</tbody>
</table>

The survey is administered to students taking BAEN 480 Biological and Agricultural Engineering Design II course. All BAEN students are required to take this class in the spring of their last full academic year prior to graduation. The questions were revised slightly for the Spring 2010 survey, corresponding to slight revisions that were made in the program outcomes in November 2009.

Because faculty are able to maintain fairly close contact with our students, we feel that the students generally have a positive attitude about their educational experience in the BAEN program. We also recognize that many people tend not to select either extreme when asked to respond to statements using a Likert scale. Therefore, we felt that an average response of 3.75 over all items relating to a specific outcome would indicate students generally felt they were well prepared in that area. The standard deviation also was calculated to get an idea of how much variation there was in the responses. Results of the survey over the past six years are shown in Figure 3-6 along with the average response over all questions.
Figure 3-6. Results of senior survey relating to each program outcome. The solid horizontal line at 3.75 on the average response scale represents our target metric.

These results indicate that we are meeting or exceeding our target metric for all program outcomes. Scores for outcomes h and j tend to be a little lower, but have improved since the last ABET cycle. These are the outcomes relating to the impact of engineering solutions in a global, economic, environmental, and societal context and to knowledge of contemporary issues.

In addition to the survey questions listed above, we ask students to indicate participation in a study abroad program, the TAMU-Mexico Student Exchange program, or other international experience. Results over the past four years given in Table 3-10 show that about 54% of our students have an international experience while a student at Texas A&M University which is slightly above our target of half the students having this type of experience.
Table 3-10. Student International Experience

<table>
<thead>
<tr>
<th></th>
<th>2010-2011</th>
<th>2011-2012</th>
<th>2012-2013</th>
<th>2013-2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students reporting international experience</td>
<td>11</td>
<td>17</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Total number student responses</td>
<td>26</td>
<td>28</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>% with international experience</td>
<td>42</td>
<td>61</td>
<td>48</td>
<td>63</td>
</tr>
</tbody>
</table>

**BAEN Alumni and Employer Surveys**—Many of our graduates maintain close ties with the department and have provided informal feedback on our educational programs over the years. During the previous accreditation cycle in 2007, the Dwight Look College of Engineering developed an alumni and employer survey for use by all programs in the college. Only responses from alumni who had graduated within the previous five years were collected for the alumni part of the survey, while there was no restriction on responses to the employer portion. We adapted our survey questions to use for the BAEN portion of that survey, but only three responses were obtained for our program. The college survey was revised and administered again in 2009. Efforts were made to compile a more comprehensive list of alumni and provide greater publicity. However, again we received only three responses to the BAEN alumni portion of the survey. The number of responses was too low on both surveys to obtain meaningful data.

During the current cycle, in 2012, the College of Engineering again developed and deployed an alumni and employer survey for use by all programs in the college. BAEN again compiled a contact list of former students and employers and the response rate was much better than the previous cycle (n=9 for the alumni survey and n=15 for the employer survey).
Figure 3-7. Results of the 2012 alumni and employer survey relating to each program outcome. The solid horizontal line at 3.75 on the average response scale represents our target metric.

**Student Performance in Key Required Courses**—For most outcomes, course grades usually are not a reliable metric to use for assessment. However, we feel that course grades in the required engineering science and departmental courses are indicative of student ability to apply mathematics, science and engineering (outcome a) and grades in ENGR 482 are indicative of student understanding of professional and ethical responsibility. We have used this assessment tool in the BAEN program since the 1998-99 academic year when the department adopted a policy requiring BAEN students to achieve a grade of C or better in all math, engineering, engineering chemistry and physics courses for those courses to count toward the student’s degree. In 2014 we added biology and organic chemistry to this requirement. This requirement is monitored by the Academic Advisor or Advising Coordinator and by degree evaluations for the students. The Academic Advisor or Advising Coordinator reviews student grades at the end of each semester and notifies students who got a grade of D or F in any of these courses that they need to repeat them. The Advising Coordinator and Academic Advisor also check schedules of students who must repeat a course to make sure the student’s enrollment has been revised as necessary prior to the beginning of the next semester.

Courses examined in the assessment of outcome a are listed in Table 3-4. Grades in these courses are based primarily on the student’s ability to apply math, science and engineering principles in solving problems; therefore, if a student is unable to apply these principles in a
course, they will not obtain a grade of C or better and have the course count toward his or her degree. Degree evaluations are available to the Advising Coordinator, Academic Advisor and students through the student information management system (Compass) via the Howdy portal on the web. Degree requirements for each catalog edition are programmed into Compass to allow evaluations to be made. The requirement that students must achieve a grade of C or better in these courses also is programmed into the evaluation.

Student performance in ENGR 482 Ethics and Engineering is used to assess outcome f. This three credit hour course is entirely dedicated to engineering ethics and focuses on analysis techniques applied to ethical problems encountered in the engineering profession. All BAEN students must take this course as part of their degree requirements. Beginning in Fall, 2014, Ray James, the instructor for ENGR 482 Ethics and Engineering began collecting data on the performance of the final exam for each student in the course and made this data available to programs for assessment. We chose to assess our student based on the ratio of BAEN % correct to ENGR 482 % correct, with an initial target of that ratio being equal to or exceeding 1.0 for 70% of the questions.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAEN 301</td>
<td>Biological and Agricultural Engineering Fundamentals I</td>
</tr>
<tr>
<td>BAEN 302</td>
<td>Biological and Agricultural Engineering Fundamentals II</td>
</tr>
<tr>
<td>BAEN 320</td>
<td>Engineering Thermodynamics</td>
</tr>
<tr>
<td>BAEN 340</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>BAEN 354</td>
<td>Engineering Properties of Biological Materials</td>
</tr>
<tr>
<td>BAEN 365</td>
<td>Unit Operations for Biological and Agricultural Engineering</td>
</tr>
<tr>
<td>BAEN 366</td>
<td>Transport Processes in Biological Systems</td>
</tr>
<tr>
<td>BAEN 370</td>
<td>Measurement and Control of Biological Systems and Agricultural Processes</td>
</tr>
<tr>
<td>BAEN 375</td>
<td>Design Fundamentals for Agricultural Machines and Structures</td>
</tr>
<tr>
<td>BAEN 479</td>
<td>Biological and Agricultural Engineering Design I</td>
</tr>
<tr>
<td>BAEN 480</td>
<td>Biological and Agricultural Engineering Design II</td>
</tr>
<tr>
<td>CVEN 305</td>
<td>Mechanics of Materials</td>
</tr>
<tr>
<td>ECEN 215</td>
<td>Principles of Electrical Engineering</td>
</tr>
<tr>
<td>MEEN 221</td>
<td>Statics and Particle Dynamics</td>
</tr>
<tr>
<td>MEEN 222</td>
<td>Materials Science</td>
</tr>
</tbody>
</table>

**Table 3-4. Courses Used for Assessment of Outcome a**

Completion of University Core Curriculum Requirements—Texas A&M University has adopted a set of core requirements intended to provide all undergraduate students a broad education. The core curriculum is intended to impart the “knowledge and skills and the need to take into account global, national, state, and local cultures” and “ensures that students will develop the essential knowledge and skills they need to be successful in college, in a career, in their communities, and in life.” The core curriculum prepares students for a lifetime of learning. All students at the university must meet these core curriculum requirements for graduation. Additional information about the university core curriculum is available in the undergraduate catalog (pages 17-19, Ed. 137, [http://catalog.tamu.edu/pdfs/14-15_UG_Catalog.pdf](http://catalog.tamu.edu/pdfs/14-15_UG_Catalog.pdf)). Completion of some of these core requirements is used to support assessment of outcomes h and j. Briefly, core requirements include:
Communication: Six credit hours including ENGL 104 Composition and Rhetoric and one other course selected from an approved list. BAEN requires ENGL 201 Technical Writing to fulfill this requirement. Skills addressed are critical thinking, communication, team work, and personal responsibility;

Mathematics: Six credit hours not to include specifically exempted remedial courses. Skills address are critical thinking, communication, empirical and quantitative;

Life and Physical Sciences: Nine credit hours. Skills addressed are critical thinking, communication, empirical, quantitative and team work;

Language, Philosophy and Culture: Three credit hours selected from an approved list of courses. BAEN requires ENGR 482 Engineering Ethics to meet this requirement. Skills addressed are critical thinking, communication, social responsibility, and personal responsibility;

Creative Arts: Three credit hours selected from an approved list of courses. Skills addressed are critical thinking, communication, team work and social responsibility;

Social and Behavioral Sciences: Three credit hours selected from an approved list of courses. Skills addressed are critical thinking, communication, empirical, quantitative, and social responsibility;

American History: Six credit hours to include no more than three hours of Texas history. Skills addressed are critical thinking, communication, social responsibility and personal responsibility;

Government/Political Science: Six credit hours, specifically POLS 206 American National Government and POLS 207 State and Local Government. Skills addressed are critical thinking, communication, social responsibility and personal responsibility;

International and Cultural Diversity: Six credit hours selected from an approved list of courses, these courses also may satisfy another degree requirement

Writing requirement. The requirement may be met by passing two writing (W) courses or one writing (W) and one oral communication (C) course. BAEN requires BAEN 480 Biological and Agricultural Design II and ENGR 482 Engineering Ethics to meet this requirement.

For BAEN students, the mathematics and natural science requirements are easily met by the curriculum. Other core curriculum requirements are met by students selecting courses from university-approved lists for each category.

**Demonstration of the Level of Achievement of BAEN Students**

Educational material and experiences aimed at meeting BAEN outcomes a through k are woven throughout the curriculum. Table 3.2 above documents coverage of a through k topics in all required and elective departmental courses.

A brief discussion of how each BAEN educational outcome is met in the curriculum is provided below. Also included in this discussion is an evaluation of collected assessment data.

**a. An ability to apply knowledge of mathematics, science, and engineering**—Our BAEN students gain an ability to apply math, science, and engineering principles through completion of required and elective courses in the curriculum. As shown in Table 3.2, outcome a is reflected as a major component in most required and elective departmental courses and required engineering science courses that students take outside the department. In addition,
outcome a is meet through required mathematics, science and engineering topic courses that students take outside the department.

We use six measures to assess achievement of outcome a (Table 3-3). An evaluation of our achievement of outcome a based on collected assessment data is given below:

- **Student Performance in Required Courses:** Our metric for achievement in required departmental and engineering science courses is a C or better for all students. Since students must receive a grade of at least a C in these courses for them to count toward their degrees, we feel we are meeting our metric.

- **Student Performance on Assignments in Required Courses:** We examined student performance on the design analysis component of the capstone design course (BAEN 480) using assessments of student performance by panels of industry cooperators and faculty. Average panel ratings were 3.9 to 4.5 over the past six years (Table 3-6) which is above our metric of 3.5. The minimum scores, which ranged from 2 to 4, dipped below our metric of 3.5. We feel we are meeting our metric for this measure.

- **FE Exam Results:** We developed two metrics to assess achievement of outcome a using FE data. First, we want our graduates to meet or exceed the ABET/Carnegie comparator group percent passing the FE exam. Over the past five years, our students have had an average percent passing rate of 86% compared to the ABET/Carnegie comparator group average of 80% (Figure 3-1). This exceeds our metric for achievement, an improvement over the last ABET cycle Second, we want our students to attain an institution average performance index for each FE subject category that meets or exceeds the performance index for the ABET/Carnegie comparator group. Over the past five years, our students generally exceeded or were within 5% of the ABET/Carnegie average for all subject areas except computers (now instrumentation and data acquisition) and chemistry (Figures 3-2 – 3-5). Chemistry was consistently within 5% of the ABET/Carnegie exam over the period of the old FE format. With the new format the performance index dropped significantly for chemistry. We will continue to monitor this score. Our students showed substantial improvements in engineering economics.

- **Senior Survey:** On four questions related to outcome a, graduating seniors indicated confidence that their undergraduate education had prepared them to apply math, science, and engineering principles (Figure 3-6). Our metric for the average response to these questions was 3.75 and the average response over the five years was 4.48, with annual average scores ranging from 4.34 to 4.57. These data indicate that we are meeting our metric for achievement.

- **Alumni Survey:** On four questions related to outcome a, alumni indicated confidence that their undergraduate education had prepared them to apply math, science and engineering principles (Figure 3-7). Our metric for the average response to these questions was 3.75 and the average of the responses for this outcome were 4.08 for the 2012 survey.

- **Employer Survey:** On four questions related to outcome a, employers indicated that BAEN graduates were prepared to apply math, science, and engineering with an average rating of 4.26, which exceeds our metric of 3.75.

All of our metrics taken together indicate that our students are meeting our expectations for outcome a.
b. An ability to design and conduct experiments, as well as to analyze and interpret data—BAEN students are required to take several courses that address design and implementation of experiments and data analysis and interpretation. Five of the required departmental courses include laboratories: BAEN 301 Biological and Agricultural Engineering Fundamentals I, BAEN 302 Biological and Agricultural Engineering Fundamentals II, BAEN 354 Properties of Biological Materials, BAEN 365 Unit Operations for Biological and Agricultural Engineering, and BAEN 370 Measurement and Control for Biological Systems and Agricultural Processes. BAEN students take an additional 12 credit hours of courses outside the department that provide significant experimental components.

Four sources of assessment data help us evaluate our achievement of outcome b. A summary of our findings from each of these data sources follows:

- **Student Performance on Assignments in Required Courses:** Student work on experimental design and data analysis/interpretation assignments is evaluated in BAEN 301, 302, 354, 365 and 370 by faculty. Our metric for success is that all students receive a C on the laboratory component of these courses. As indicated in Table 3-7, average student scores for the laboratory component of these courses were above C (70%). Minimum scores in all courses with a lab component fell below 70% in at least one year. However, students who were significantly below a C average for this component did not pass the course. Overall, we feel we are meeting our metric.

- **Senior Survey:** Senior survey results are shown in Figure 3-6. Average student responses to the four questions related to outcome b over the five year period was 4.27, ranging from 4.08 to 4.35 and well above our metric of 3.75.

- **Alumni Survey:** On two questions related to outcome b, alumni indicated that they were well prepared to design and conduct experiments and analyze and interpret data with an average rating of 4.0, which is above our metric of 3.75.

- **Employer Survey:** On two questions related to outcome b, employers indicated that BAEN graduates were well prepared to design and conduct experiments and analyze and interpret data with an average rating of 4.24, which is above our metric of 3.75.
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—BAEN students experience engineering design across the curriculum. Within the department, students experience design in BAEN 150 Introduction to Biological and Agricultural Engineering Design (semester-long, industry-based design projects), BAEN 302 Biological and Agricultural Engineering Fundamentals II, BAEN 370 Measurement and Controls for Biological Systems and Agricultural Processes (robot design and competition), and the senior capstone design courses BAEN 479/480 Biological and Agricultural Engineering Design I and II (year-long, industry-based design projects). Design projects are also an important component of many engineering electives offered both in and out of the department (Table 3-2).

Four data sources are used to assess achievement of outcome c. Evaluation of assessment data is summarized below:

- Student Performance on Assignments in Required Courses: Faculty assess student performance on design projects in BAEN 302 and 370 and panels of industry cooperators and faculty assess student performance in the capstone design sequence to evaluate achievement of outcome c. Our metric is that students will achieve at least a C on design components of these key required courses. Data for BAEN 302 and 370 are summarized in Table 3-7 and industry/faculty panel ratings for BAEN 479/480 are presented in Table 3-6. For the courses reported in Table 3-7, all but one average score in one course in one year are above our metric of at least a C (70%) but several minimum scores were below. While we would like to have everyone perform above our metric, we realize it is likely a few students will not meet our metric in the lower level courses. We expect those students to improve as they continue to senior level courses or drop out of the program.

- Student Performance on Assignments in Required Courses: Data from BAEN 479/480 reported in Table 3-6 show that average industry cooperator and faculty panel ratings of student work related to design were 3.9 or greater which met our metric of 3.5.

- Senior Survey: Five questions on the senior survey address outcome c. Responses to these questions for the past five years were all above 4.0 (Figure 3-6) ranging from 4.12 to 4.34. These responses were above our metric of 3.75, indicating achievement of this outcome.

- Alumni Survey: On two questions related to outcome c, alumni indicated that they were well prepared to design components or systems within realistic constraints with an average rating of 3.94, above our metric of 3.75.

- Employer Survey: On two questions related to outcome c, employers indicated that BAEN graduates were well prepared to design components or systems within realistic constraints with an average rating of 4.34, which was significantly above our metric of 3.75.
d. An ability to function on multidisciplinary teams—BAEN students gain substantial experience functioning in teams. Several departmental courses, especially those with significant laboratory or design components, require students to work in teams to complete course assignments. Teaming issues (team roles, code of cooperation, etc.) are specifically taught in ENGR 111 Foundations in Engineering I.

Teaming is assessed using four data sources.

- **Student Performance in Required Courses:** In BAEN 150 and 479/480, team performance is measured by peer and faculty evaluations. Average ratings for teaming were above 4.0, indicating we are meeting our metric of 3.5.
- **Senior Survey:** Four questions on the senior survey address tearming. Average responses to these questions was 4.16 which exceeded our metric of 3.75 for all five years shown in Figure 3-6.
- **Alumni Survey:** On one question related to outcome d, alumni indicated that they were well prepared to function on multi-disciplinary teams with an average rating of 4.33.
- **Employer Survey:** On one question related to outcome d, employers indicated that BAEN graduates were well prepared to function on multi-disciplinary teams with an average rating of 4.64, which is above our metric of 3.75.

e. An ability to identify, formulate, and solve engineering problems—BAEN students have myriad opportunities to hone their skills at identifying, formulating, and solving engineering problems. All departmental courses address engineering problem solving (Table 3-2). In addition, students work on problem solving skills in other engineering course taken outside the department.

Problem solving is assessed using six methods:

- **Student Performance on Assignments in Required Courses:** A comprehensive evaluation of students’ problem solving skills is obtained during the capstone design project in BAEN 479/480. We use industry cooperator and faculty panel ratings of student work (Table 3-6) to assess this. Student work on the design problems was highly rated by a panel of faculty and industrial and governmental cooperators. Average panel rankings of 4.1 or above were well above our metric of 3.5.
- **Student Performance in Required Courses:** Our metric for achievement in required departmental engineering courses is a C or better for all students. Since students must receive a grade of at least a C in these courses for them to count toward their degrees, we feel we are meeting our metric.
- **FE Exam Results:** As described under outcome a, we compared our students’ average percentage passing on the FE exam to the Carnegie comparator group average (Figure 3-1). Over the past six years, our students were very close to the Carnegie average percent passing, essentially meeting our metric for outcome achievement.
- **Senior Survey:** The senior survey contains four questions addressing engineering problem solving. Seniors responded that they were very confident in their preparation to undertake problem solving (Figure 3-6). Average scores for the last five years were all above 4.0, ranging from 4.31 to 4.51 and exceeding our metric of 3.75.
- **Alumni Survey:** On one question related to outcome e, alumni indicated that they were prepared to identify, formulate and solve engineering problems with an average rating of 4.33, exceeding our metric of 3.75.
• Employer Survey: Employers indicated that BAEN graduates were well prepared to identify, formulate and solve engineering problems with an average rating of 4.20, which was slightly below our metric of 3.75.

f. An understanding of professional and ethical responsibility—All BAEN students are required to complete a course dedicated entirely to engineering ethics and professional responsibility (ENGR 482 Ethics and Engineering). Engineering ethics and professionalism are also addressed in the capstone design courses BAEN 479/480.

Assessment of achievement for outcome f is accomplished using data from five sources, as described below.

• Student Performance in Required Courses: Since ENGR 482 is entirely devoted to engineering ethics and professional responsibility, we use student grades and grades on individual questions on the final in this course as an assessment for outcome f. Our metric for the former is that all students receive at least a C in the course and all graduates meet this requirement. Our metric on the latter is to have the ratio of the BAEN % correct to the ENGR 482 % correct equal or exceed 1.0 on 70% of the final questions. The overall ratio across all questions was 0.95. The BAEN % correct equaled or exceeded the ENGR 482 % correct on 50% of the questions, which is significantly below our metric. While this is low, this measure is based on only one year of data. We expect this to improve over time.

• FE Exam Results: Data indicate that our students taking the FE exam achieved the same or slightly lower percentage correct on the ethics portion as the ABET/Carnegie comparator group (Figure 3-5) when taken as a two year average. However, yearly ratios have dropped below 1.0 over the last four exams and require closer scrutiny.

• Senior Survey: The senior survey contains three questions regarding preparation in ethics and professionalism. The average responses to these questions (Figure 3-6) was 4.19, above our metric of 3.75.

• Alumni Survey: Alumni indicated that upon graduation they had an understanding of professional and ethical responsibility with an average of 4.33, which is above our metric of 3.75.

• Employer Survey: Employers indicated that BAEN graduates had an understanding of professional and ethical responsibility with an average rating of 4.50, which was significantly above our metric of 3.75.

g. An ability to communicate effectively—BAEN students have many opportunities to acquire and practice communication skills. Written or oral communications are important components in many required BAEN courses including BAEN 150 Introduction to Biological and Agricultural Engineering Design and the capstone design courses BAEN 479/480. The university core curriculum requires a communication component which is incorporated in the BAEN curriculum as ENGL 104 Composition and Rhetoric and ENGL 210 Technical Writing. In addition, the university core curriculum requires all students to complete at least two writing intensive courses in the major; for BAEN students, these courses are ENGR 482 Ethics and Engineering and BAEN 480 Biological and Engineering Design II.

Communication is assessed using student performance on assignments in required courses and via the graduating senior, alumni and employer surveys.
Student Performance on Assignments in Required Courses: Assignments in BAEN 301 and 302 and BAEN 354 were evaluated to assess communication. As indicated in Table 3-7, the average (minimum) scores for communication in these courses were ranged from 67 (39) in BAEN 302 to 96 (90) in BAEN 301. However, data from assignments in these courses was only collected during one year in this cycle, an oversight that will be corrected in future years.

Student Performance on Assignments in Required Courses: BAEN 480 is a designated writing intensive course for which approximately one-third of the course grade is based on writing. Students must make a grade of C or better on this component to pass the course. Additionally, the student design reports were evaluated on this component by faculty and industry cooperators with average ratings ranging from 4.2 to 4.5, well above our metric of 3.75.

Senior Survey: On the senior survey, students indicated they felt well prepared in communications. Responses averaged over the four communication-related questions on the survey were well above 4.0 (Figure 3-6), ranging from 4.28 to 4.40 over the five year period, and above our metric of 3.75.

Alumni Survey: On two questions related to outcome g, alumni indicated that they have the ability to communicate with an average rating of 4.0, which is above our metric of 3.75.

Employer Survey: On two questions related to outcome g, employers indicated that BAEN graduates demonstrated an ability to communicate with an average rating of 4.07, which was above our metric of 3.75.

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context—We use several courses featuring design projects to provide BAEN students experience in developing engineering solutions that are audience-appropriate. Design projects solicited from industry are used in the freshman introductory design course, BAEN 150, and in the capstone design sequence, BAEN 479/480. Projects for these courses require consideration of the constraints on the design imposed by global, economic, environmental, and social considerations. Several elective courses also feature design projects that require development and consideration of audience-appropriate constraints. As part of the university core curriculum, students are required to take three credit hours of social science courses and six hours of courses featuring international and cultural diversity.

We assess student ability to consider global, economic, environmental, and societal context using four measures:

Student Performance on Assignments in Required Courses: We use a panel of industrial/governmental cooperators and faculty to evaluate student performance on capstone design projects (Table 3-6). Panel ratings indicate that students define appropriate design constraints that incorporate global, economic, environmental, and societal concerns in completing their design projects for BAEN 480 with an average ranking of 4.0 or above which is well above our metric of 3.75.

Senior Survey: Four questions on the senior survey addressed the global, economic, environmental and societal impact of engineering solutions. Responses for these questions averaged 3.86 (Figure 3-6), with only one score (3.72 in 2012) dipping slightly below our metric of 3.75.
Alumni Survey: On one question related to outcome h, alumni had an average rating an outcome h of 3.56, slightly below our metric of 3.75. This raises some concern although the other metrics indicate we are achieving this outcome. We will be discussing this during the coming year to determine if action needs to be taken.

Employer Survey: Employers indicated that BAEN graduates had an average understanding of the impact of engineering solutions in a global and societal context with an average rating of 4.31, which was well above our metric of 3.75.

i. A recognition of the need for, and an ability to engage in life-long learning—BAEN students gain knowledge and practice in finding and critically evaluating new knowledge at various points in the curriculum. Project-oriented courses such as BAEN 150 and the capstone design courses (BAEN 479/480) require students to research existing technology and other background information related to their project.

Life-long learning was assessed using four instruments:

- Student Performance on Assignments in Required Courses: Student search and evaluation of technical information was evaluated in the capstone design courses. Student performance on background research was evaluated by a panel of industrial/governmental cooperators and faculty. Average rankings ranged from 3.5 to 4.23, with big fluctuations from year to year. We will continue to monitor this one and maybe refine the questions asked in the evaluation.
- Senior Survey: Three questions on the senior survey address outcome i. Average responses for these questions were all above 4.0, ranging from 4.02 to 4.42, and above our metric of 3.75 (Figure 3-6) indicating our students feel they are well prepared in this area.
- Alumni Survey: On one question related to outcome i, alumni indicated a strong recognition of the need for and an ability to engage in life-long learning, with an average rating of 4.11, above our metric of 3.75.
- Employer Survey: On one question related to outcome i, employers indicated that BAEN graduates were well prepared to pursue life-long learning with an average rating of 4.40, above our metric of 3.75.

j. A knowledge of contemporary issues—BAEN students gain knowledge of contemporary issues through the university core curriculum and have opportunities to apply such knowledge to engineering design through the capstone design course. In addition, they have an opportunity to participate in our faculty-led study abroad program in environmental soil and water engineering in Belgium and our Mexico Student Exchange program as well as other international activities.

Achievement of objective j was assessed using four measures.

- Student Participation in International Activities: Student participation in international activities is self-reported on the senior survey. Over the past four years, 54% of students taking the survey have had international experience, which is slightly above our target of 50%. However, it is up from 44% during the last ABET cycle.
- Senior Survey: Three questions on the senior survey address contemporary issues. Average student responses to these questions was 3.93, with average annual scores
ranging from 3.80 to 4.07 (Figure 3-6). This was substantially higher than the previous ABET cycle.

- **Alumni Survey**: Alumni indicated that they had an average knowledge of contemporary issues with an average rating of 3.22, which is below our metric of 3.75. This raises some concern although the other metrics indicate we are achieving this outcome. We will be discussing this during the coming year to determine if action needs to be taken.
- **Employer Survey**: Employers indicated that BAEN graduates had a knowledge of contemporary issues with an average rating of 3.92, which was above our metric of 3.75.

**k. An ability to apply the techniques, skills, and engineering tools necessary for solving complex engineering problems**—Acquisition of engineering techniques, skills, and tools is a major focus of most departmental courses, and the ability to use these is an important aspect of the capstone design courses.

We assessed achievement of outcome k using three measures:

- **Student Performance on Assignments in Required Courses**: Student use of current and appropriate technology was evaluated during the capstone design sequence. Industrial/governmental cooperators and faculty were asked to rate design team performance in completing appropriate engineering analysis and appropriate technical resources and references (Table 3-6). Average rankings ranged from 3.5 (for technical resources) to 4.5 (for appropriate engineering analysis).
- **Senior Survey**: The senior survey contained three questions directed toward outcome k. Average responses for those questions was 4.17 over the five years (Figure 3-6). All years were above our metric of 3.75.
- **Alumni Survey**: Alumni indicated that upon graduation they had an ability to apply the techniques, skills, and engineering tools necessary for solving complex engineering problems with an average of 3.89 which is just above our metric of 3.75.
- **Employer Survey**: On two questions related to outcome k, employers indicated that BAEN graduates were well prepared to apply techniques and engineering tools to solve complex engineering problems with an average rating of 4.43, which was significantly above our metric of 3.75.

In summary, we feel that we are achieving our program outcomes and that our graduates are well-prepared to start their careers or continue their education. Results from the employer survey from 2012 show that employers are satisfied with the quality of our graduates and consider them well-prepared to meet the needs of their customers. Results from the alumni survey indicated that graduates feel less confident in outcomes h and j (understanding of impact of engineering solutions and knowledge of contemporary issues). While most of those results did not raise immediate concerns since the number of survey participants was small, we do plan to look at the outcomes with the lowest ratings during the coming year. We believe our objective tools provide very good data for assessing our outcomes, particularly the FE exam results since a large portion of our graduates take it. However, that percentage has dropped over the last three years, so we are looking for ways to encourage our students to take the FE while they are still at TAMU. We plan to review and refine our plan for gathering information about student performance on assignments in key required courses since occasionally data are lost or not collected. Rubrics to measure specific outcomes in specific courses may be
developed to increase the number of direct measurement tools. We also plan to review the information collected to ensure it continues to provide a good assessment of specific outcomes. One concern about our assessment plan has been our alumni and employer surveys. Responses from alumni in 2012, while 3 times that from the previous two cycles, are still relatively low. The next deployment of the survey in Spring, 2015 will focus strictly on graduates from the past two years. We intend to use our social media and other contacts to try to increase our response rate.
CRITERION 4. CONTINUOUS IMPROVEMENT

A. Information Used for Program Improvement

The Engineering Undergraduate Program Committee (EUPC) meets at least once each semester to review student performance and evaluate the need for any program changes. Data used to assess program outcomes and outcome assessment results are described under Criterion 3.

Information reviewed to assess achievement of program outcomes includes student performance on assignments in key required courses, results from senior surveys, results from FE exams, feedback from the EAC, results from alumni and employer surveys, student performance in key required courses, and feedback from course instructors regarding student performance. The EUPC also considers information from the College of Engineering Undergraduate Advisors meetings and the American Society of Agricultural and Biological Engineers (ASABE) and other relevant professional organizations regarding curricular issues. Results obtained from program outcomes assessment are provided in the Criterion 3 discussion.

B. Actions to Improve the Program

Four major actions have been taken since the last ABET review to improve the program. These actions resulted from analysis of program assessment results as well as from consideration of other factors. These actions include moving to a common freshman year with the Dwight Look College of Engineering, strengthening the computer/engineering tools content of the curriculum, strengthening the biological content of the curriculum, and strengthening the communication, knowledge of contemporary issues and engineering economics content of the curriculum through changes in BAEN 479/480. The discussion below of each of these actions includes the changes made and the basis for these changes.

1. Dwight Look College of Engineering Common Freshman Year

Data collected over several years by the College of Engineering showed that up to 50% of incoming freshmen engineering students change their majors prior to graduation. In an effort to better inform students of their choices in engineering majors and to help increase retention to departments in the Fall 2014 the College of Engineering instituted a common freshman year for all engineering students and no longer admitted freshmen to individual departments. BAEN joined the common freshman year in Fall 2015.

Students enter as ENGE students with a preference for a particular engineering program. Admitted students follow a common first-year engineering curriculum. During their first semester they are given several opportunities to interact with departments including presentations given through ENGR 111, socials, club meetings and the like. Students apply to specific engineering major(s) through the Entry-to-a-Major process after completing specified course work (http://engineering.tamu.edu/academics/advisors-procedures/entry-to-a-major).

General engineering students are required to complete at least three courses at Texas A&M—one course from each category of math, science and engineering—before they can apply to a major. Acceptance to a major is competitive. Departments review entry-to-a-major applications and admit students based on a holistic review that includes GPA, extra-curricular activities, an essay and other factors.

BAEN is located in both the College of Engineering and College of Agriculture and Life Sciences, but until this year our students were admitted through the COALS. The COE met
their admittance capacity long before COALS which led to quite a few incoming freshman entering BAEN as freshman with the intention to transfer to another engineering department at the end of their first or second semester. Many times, up to half of the students in BAEN 150 Introduction to Biological and Agricultural Engineering had the intention of transferring. Standards to transfer into some of the more popular engineering programs (biomedical, chemical, petroleum) where such that many students could not transfer for a variety of reasons but primarily because of low GPAs. With the new process, only students interested in pursuing a degree in BAEN will apply to the department through the entry to major process. Additionally, unlike with the current admissions policy, BAEN will review and control who gains entry to our major. This will guarantee that the students coming into the major already have a thorough grounding and have been successful in calculus, physics or chemistry and engineering fundamentals before moving on in the curriculum.

2. Strengthening the Curriculum – Computers/engineering tools

Analysis of scores from the FE exam for computers (instrumentation and data acquisition on the Other Disciplines exam in the new format), have consistently been below or just at our metric of 1.0 for the ratio of BAEN students to the ABET/Carnegie comparator group. Additionally, alumni scored themselves just above our metric of 3.75 out of 5 on their ability to achieve outcome k and scores from our senior survey, although good, still indicate a lower confidence in this ability than for most of the other outcomes.

In conjunction with joining the common freshman year in the COE, BAEN was asked to eliminate its freshman introductory course BAEN 150 Introduction to Biological and Agricultural Engineering Design. The EUPC meeting in the Fall of 2013 decided to replace this course with a 3 hour course in the first semester of the sophomore year, BAEN 201 Analysis of Biological and Agricultural Engineering Problems. The focus of this class is two-fold, to introduce students to the variety of sub-disciplines in biological and agricultural engineering and an introduction to programming and logic. Programming exercises will be geared toward case studies in the biological and agricultural engineering.

As ENGE students, all new freshmen are required to participate in the Bring Your Own Device (BYOD) program. Students to purchase a laptop from a group of approved devices. The benefit to the curriculum is that instructors can now ask students to bring and use their computers in the classroom, further integrating and improving their ability to use engineering tools.

Finally, BAEN has consistently improved the computing facilities available to students. We have added 20 total computers to the 3 (up from 2) general computer labs. No computer is more than 4 years old as about 25% of them are rotated out of service every year. Additionally they are equipped with the latest tools and software available (as detailed in the facilities section below).

3. Strengthening the Curriculum – Communication, engineering economics, knowledge of contemporary issues, teamwork

As the culmination to our student’s academic career, BAEN 479/480 Biological and Agricultural I and II are the two most important courses in assessing our students with regard to our educational outcomes. As such, we are continually striving to improve this course both in content and in the way that we assess these outcomes. During our last ABET cycle we
targeted engineering economics as an area where improvement was needed. To that end the structure of BAEN 479 and 480 were changed. BAEN 479 now focuses on engineering economics, project management, and ethics, and ends with the assignment of teams and capstone projects. BAEN 480 now focuses on the process of design from problem definition to final presentation. This increased focus on economics has resulted in higher scores on the economics portion of the FE exam, but also higher ratings from our industry advisors and faculty on the final design projects.

In 2014 it was recognized with the continued growth of the BAEN program that the students in BAEN 479 and 480 would be better served if the course was co-taught. To that end, Dr. Rabi Mohtar was added as a second full time instructor to that course. Because of the additional faculty resources, the instructors now have time to meet with teams individually on a weekly basis. Additionally, Dr. Mohtar comes to us from Purdue University via the Qatar Foundation and brings with him a wealth of experience in involving students in international projects with broad impacts on local societies. For example, in 2013-2014, one of the capstone projects required students to design a sustainable aquaculture feeding process. This process is intended to create a source of revenue for local villagers who have been forced to sell their children into slavery as a means to support their families. For 2014-2015 several of the projects are international in scope, including a wastewater treatment facility re-design in Ecuador and an air quality assessment in India.

Because assessment of our educational outcomes rely so heavily on this course we wanted to make sure that we were getting as much feedback from our constituents as we could. In Spring 2012 BAEN began to hold a “Capstone Event” featuring all of the projects from our capstone course. All industry clients, faculty, graduate students and our EAC members are invited to come to this half-day event and to participate in evaluating the projects. Each team produces a research quality poster and along with any prototypes they might have developed present their designs to these constituent groups. All who attend are asked to evaluate the posters and a prize is awarded to the highest rated poster. As a result the number of evaluations that we have to assess for each project has risen dramatically and has provided us with excellent feedback on how well are students are meeting our educational outcomes.

4. Strengthening the Curriculum – Biological content

Beginning with the spring 2010 semester, we replaced BAEN 265 with BAEN 301 Biological and Agricultural Engineering Fundamentals I which emphasizes agricultural topics. This was followed in the fall 2010 semester by BAEN 302 Biological and Agricultural Engineering Fundamentals II which emphasizes biological topics including microbiology, microbial growth kinetics, enzyme kinetics, bioreactors and bioseparation processes. At the time of this transition the lab portion of these classes was being taught in several research labs throughout the department and had no dedicated lab space. In 2012, with the departure of the department that was sharing some of the space in Scoates we were able to negotiate with COALS for additional space in the building. Part of that space was dedicated to creating a new Biological Teaching Lab.

This laboratory equipped with an autoclave, laminar flow hood, fume hoods, incubator, shaker, waterbath, balances, spectrophotometer, distillation columns, freezer, and refrigerator. Additionally, it contains state-of-the-art computer and audio-visual equipment for instruction. The laboratory is used for lab assignments in BAEN 301 and 302 Biological and Agricultural
Engineering Fundamentals I and II and BAEN 354 Properties of Biological Materials and when not being used for courses can be used for undergraduate research.
CRITERION 5. CURRICULUM

A. Program Curriculum

1. Student Preparations for Professional Career.

The BAEN curriculum gives students a thorough background in mathematics, physical and biological sciences, engineering science and engineering design in addition to broadening courses provided by the university core curriculum. The curriculum provides multiple opportunities for students to develop their abilities in each of the program outcomes. In turn, this gives graduates the foundation upon which to build successful careers within the scope of our program educational objectives.

2. Credit Hour Requirements

Course requirements for professional components of the BAEN curriculum by year and semester are given in Table 5-1. Mathematics and basic sciences comprise 41-44 hours (ABET minimum 32 hours), and engineering science and design comprise 54-57 hours (ABET minimum 48 hours).

Table 5-1. Curriculum
Biological and Agricultural Engineering

<table>
<thead>
<tr>
<th>Year, Semester</th>
<th>Course (Department, Number, Title)</th>
<th>Category (Credit Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1;1</td>
<td>BAEN 150 Introduction to Biological and Agricultural Engineering Design</td>
<td>Math &amp; Basic Sciences 1 √</td>
</tr>
<tr>
<td>1;1</td>
<td>ENGL 104 Composition and Rhetoric</td>
<td>Engineering Topics</td>
</tr>
<tr>
<td>1;1</td>
<td>ENGR 111 Foundations of Engineering I</td>
<td>Significant Design 1</td>
</tr>
<tr>
<td>1;1</td>
<td>MATH 151 Engineering Mathematics I</td>
<td>General Education</td>
</tr>
<tr>
<td>1;2</td>
<td>PHYS 218 Mechanics</td>
<td>Other</td>
</tr>
<tr>
<td>1;2</td>
<td>BIOL 113 Essentials in Biology</td>
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</tr>
<tr>
<td>1;2</td>
<td>CHEM 107 General Chemistry for Engineering Students</td>
<td>Math &amp; Basic Sciences 3</td>
</tr>
<tr>
<td>1;2</td>
<td>CHEM 117 General Chemistry for Engineering Students Laboratory</td>
<td>Other 1</td>
</tr>
<tr>
<td>1;2</td>
<td>ENGR 112 Foundations of Engineering II</td>
<td>Engineering Topics 1</td>
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<tr>
<td>1;2</td>
<td>MATH 152 Engineering Mathematics II</td>
<td>General Education</td>
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<tr>
<td>1;2</td>
<td>MATH 251 Engineering Mathematics III</td>
<td>Other 4</td>
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<tr>
<td>1;2</td>
<td>CHEM 222 Elements of Organic and Biological Chemistry</td>
<td>Math &amp; Basic Sciences 3</td>
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<td>2;1</td>
<td>MEEN 221 Statics and Particle Dynamics</td>
<td>Other 3</td>
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<td>2;1</td>
<td>MEEN 222 Materials Science</td>
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<td>2;1</td>
<td>MATH 251 Engineering Mathematics III</td>
<td>Other 3</td>
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<td>PHYS 208 Electricity and Optics</td>
<td>Math &amp; Basic Sciences 4</td>
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<td>2;2</td>
<td>BAEN 301 Biological and Agricultural Engineering Fundamentals I</td>
<td>Math &amp; Basic Sciences 4 √</td>
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<td>2;2</td>
<td>BAEN 320 Engineering Thermodynamics</td>
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<td>CVEN 305 Mechanics of Materials</td>
<td>Math &amp; Basic Sciences 3</td>
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<td>ENGL 210 Scientific and Technical Writing</td>
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<td>Year, Semester</td>
<td>Course (Department, Number, Title)</td>
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<tr>
<td>2;2</td>
<td>MATH 308 Differential Equations</td>
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<td>3;1</td>
<td>BAEN 302 Biological and Agricultural Engineering Fundamentals II</td>
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<td>BAEN 340 Fluid Mechanics and Hydrology</td>
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<td>BAEN 354 Engineering Properties of Biological Materials</td>
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<td>3;1</td>
<td>BAEN 375 Design of Agricultural Machines and Structures</td>
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<td>3;1</td>
<td>ECEN 215 Principles of Electrical Engineering</td>
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<td>3;2</td>
<td>BAEN 365 Unit Operations for Biological and Agricultural Engineering</td>
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<td>BAEN 366 Transport Processes in Biological Systems</td>
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<td>BAEN 370 Measurement and Control of Biological Systems and Agricultural Processes</td>
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<td>Mathematics Elective</td>
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<td>University Core Curriculum Elective</td>
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<td>University Core Curriculum Elective</td>
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<td>BAEN 479 Biological and Agricultural Engineering Design I</td>
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<td>4;1</td>
<td>ENGR 482 Ethics and Engineering</td>
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<td>4;1</td>
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<td>4;1</td>
<td>Engineering Elective</td>
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<td>University Core Curriculum Elective</td>
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<td>BAEN 480 Biological and Agricultural Engineering Design II</td>
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<td>Biological and Agricultural Engineering Elective</td>
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<td>Technical Elective (upper level science or engineering)</td>
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<td>University Core Curriculum Elective</td>
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<td><strong>TOTALS - ABET BASIC-LEVEL REQUIREMENTS</strong></td>
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<td><strong>OVERALL TOTAL FOR DEGREE</strong></td>
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<td><strong>PERCENT OF TOTAL</strong></td>
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<td>Totals must satisfy one set</td>
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<td>Minimum semester credit hours</td>
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<td>Minimum percentage</td>
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### Supplement to Table 5-1. Curriculum

#### Biological and Agricultural Engineering Electives

<table>
<thead>
<tr>
<th>Course (Department, Number, Title)</th>
<th>Math &amp; Basic Sciences</th>
<th>Engineering Topics</th>
<th>Significant Design</th>
<th>General Education</th>
<th>Other</th>
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<tr>
<td>BAEN 412 Hydraulic Power</td>
<td>3</td>
<td>√</td>
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<td>BAEN 414 Renewable Energy Conversions</td>
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<td>BAEN 417 Nanoscale Biological Engineering</td>
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### Table 5-2. Course and Section Size Summary
**Biological and Agricultural Engineering**

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</table>

¹ Enter the appropriate percent for each type of class for each course (e.g., 75% lecture, 25% laboratory).

²Course includes a recitation period for students to work problems with instructor.

All students take a six-hour, two-semester capstone design experience: BAEN 479 Biological and Agricultural Engineering Design I and BAEN 480 Biological and Engineering Design II. BAEN 479 is a fall semester course that includes basic aspects of engineering design, creativity, intellectual property, engineering economics, project management, and problem definition and analysis. During this semester, design problems are posed by clients from industry and government agencies to provide a variety of problems relevant to different emphasis areas within the curriculum. Students select a problem based on their particular area of interest, and teams are formed to tackle the problems. Problems addressed by the students for 2013-2014 are listed in Table 5-3.

**Table 5-3. Capstone Course Problems for 2013-2014.**

<table>
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<tr>
<th>Client</th>
<th>Problem</th>
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<tbody>
<tr>
<td>The Mercy Project College Station, TX</td>
<td>Aquaculture Feed Processing for Ghana, Africa</td>
</tr>
<tr>
<td>Blue Bell Creameries Brenham, TX</td>
<td>Water Conservation in Ice Cream Processing</td>
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<tr>
<td>Aggie Pullers College Stations, TX</td>
<td>Drawbar Dynomometer for a Quarter-Scale Tractor</td>
</tr>
<tr>
<td>San Antonio River Authority, San Antonio, TX</td>
<td>Erosion Control at Goliad High School</td>
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<tr>
<td>Cox Family Farms, Brazos County, TX</td>
<td>Raw Milk Processing and Handling for a Micro-Dairy</td>
</tr>
<tr>
<td>Nabors Corporate Services, Houston, TX</td>
<td>Propant Handling and Dispensing System</td>
</tr>
<tr>
<td>San Antonio River Authority, San Antonio, TX</td>
<td>Trash Collection System for the San Antonio River</td>
</tr>
</tbody>
</table>

During the spring semester in BAEN 480, each team must develop a problem definition, identify constraints, pose several alternative solutions to the problem and prepare a final design solution to their problem. In developing their design problem solutions, students must draw on materials from a variety of courses in the curriculum as well as seek information not previously covered. Because the design problems used for BAEN 479 cover a wide range of topics, course materials used in developing solutions will vary from one project to another. For example, students working on the Blue Bell Creameries water conservation project this past year had to utilize and integrate material learned in courses such as BAEN 340 (fluid flow), BAEN 365 (pump selection), and BAEN 370 (control systems) whereas students working on the quarter-scale tractor drawbar dynomometer problem had to use materials from BAEN 354 (material properties), BAEN 375 (machine systems), and BAEN 370 (control systems). The two teams working on developing an aquaculture feed processing system in Ghana, Africa had to incorporate material from BAEN 365 (unit operations), BAEN 366 (heat transfer), BAEN 370 (control systems), and BAEN 375 (machine systems). The final design solution also must include considerations of product liability, social impact, environmental impact, economics,
ethical issues, health and safety, manufacturability, and sustainability as appropriate to the problem. Regulations and standards affecting the design also must be considered. Beginning in 2012, BAEN began holding a Capstone Event. The intent of the event is to bring all clients, faculty, and EAC members together to evaluate the final projects (based on a-k) through a half-day poster session/competition. Each team makes a poster presentation to all present at the capstone event and also presents a written report to the instructor and client. Samples of these reports also will be available electronically at the time of the visit.

4. Curricular Components Consistent with Outcomes and Objectives.

BAEN students take 14 hours of required mathematics (calculus and differential equations), 3 hours of mathematics elective (advanced math or statistics), 15 hours of chemistry and physics that includes laboratory experience, 7 hours of biological sciences that includes laboratory experience, and 3 hours of materials science. As summarized in Table 5-1, all students exceed the mathematics and basic sciences minimum.

BAEN students take 14 hours of basic engineering science courses (computer programming and problem solving, statics and particle dynamics, thermodynamics, mechanics of materials, and electrical circuits), 24 hours of departmental core courses (agricultural engineering fundamentals, biological engineering fundamentals, properties of biological materials, fluid mechanics, machine design, instrumentation and control, heat and mass transfer, and unit operations), 6 hours of capstone design, and 9 hours of engineering electives. All students exceed the minimum requirement for engineering topics.

5. Cooperative Education

Students participating in the cooperative education program take ENGR 385 Problems for Co-op Students during the semester or summer session they are completing a work assignment. Each student must complete a research paper discussing the work completed during that term. Our departmental policy is to allow students to receive one credit hour for each semester or summer work assignment. A maximum of three credit hours can be used to fulfill engineering elective requirements in the curriculum.

B. Prerequisite Flow Chart

The prerequisite structure of the BAEN curriculum is shown below in Figure 5-1. Courses are grouped by semester as displayed in the undergraduate catalog.
Figure 5-1. Prerequisite flow chart for Biological and Agricultural Engineering curriculum.

C. Course Syllabi
Course syllabi are provided in Appendix A.
CRITERION 6. FACULTY

A. Leadership Responsibilities
While ultimate leadership responsibility lies with the department head, day-to-day leadership of the program is provided by the advising coordinator for undergraduate engineering programs, currently Dr. Patricia Smith. Dr. Smith chairs the Engineering Undergraduate Program Committee (EUPC) and also is the ABET coordinator for the program.

B. Authority and Responsibility of Faculty
The EUPC has primary responsibility for the curriculum including course creation, modification and evaluation. New courses may be proposed by individual faculty members interested in teaching a relevant topic or they may be suggested by faculty seeing particular needs or opportunities. The EUPC periodically reviews each course in the curriculum to determine if it is meeting the needs of the program. If it appears modifications are needed, they are discussed with the faculty member responsible for the course. Minor changes in course content can be implemented immediately by the instructor. If changes are made to course content that result in a modification of the catalog description, a new course title, or a change in prerequisites, those changes must be submitted to the college curriculum committee and dean. Upon approval by the college curriculum committee and dean, the changes then go to the university curriculum committee and then to the Faculty Senate for final approval. New courses to be listed in the undergraduate catalog follow a similar path for approval.

In addition to course review by the EUPC, student evaluations of each course and instructor are conducted each semester. Results of the student evaluations are returned to the instructor the following semester. A summary of the student evaluations also is provided to the department head. The department head also gets feedback from students regarding quality of courses during focus group sessions with senior students.

C. Faculty
There are 22 full-time faculty members in the department with teaching appointments supporting the BAEN program. In addition, Dr. Srinivasan (Director of the Spatial Sciences Lab, Forest Science Department) has a joint appointment in the department. Credentials, experience, and workload of the faculty supporting this program are detailed in Tables 6-1 and 6-2.
Table 6-1. Faculty Workload Summary

Biological and Agricultural Engineering

<table>
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<tr>
<th>Faculty Member</th>
<th>FT or PT ¹ ²</th>
<th>Classes Taught</th>
<th>Term and Year ³ ⁴</th>
<th>Total Activity Distribution ²</th>
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^1 Indicate Term and Year for which data apply (the academic year preceding the visit).
^2 Activity distribution should be in percent of effort. Members' activities should total 100%.
^3 Indicate sabbatical leave, etc., under "Other."
^4 FT = Full Time Faculty   PT = Part Time Faculty
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*Retired during 5 year period

Instructions: Complete table for each member of the program faculty. Use additional sheets if necessary. Updated information is to be provided at the time of the visit. The level of activity should reflect an average over the year prior to visit plus the two previous years.

Column 3 Code: TT = Tenure Track       T = Tenured       NTT = Non Tenure Track
D. Faculty Competencies

All faculty teaching BAEN courses have a PhD and they generally teach courses in their area of specialization. Most of the faculty involved in teaching engineering classes have received degrees from multiple institutions and all but two have received their PhD from institutions other than Texas A&M University. Most are licensed professional engineers (85%) and are very involved in professional societies. Thirteen have some experience in industry and many are regularly involved in consulting activities. All are involved in leading edge research in their area of expertise and publish regularly. The students are highly complementary of departmental faculty during the senior exit focus sessions. They appreciate the teaching capabilities and also the friendly, helpful atmosphere created by the entire faculty.

The BAEN program has four areas of specialization:

- Environmental and Natural Resources Engineering
- Renewable Energy Engineering
- Food and Bioprocess Engineering
- Machine Systems Engineering

There are 12 faculty members involved in undergraduate engineering teaching who have expertise in water resources and air quality related to environmental and natural resources engineering (Engler, Gilley, Huang, Karthikeyan, Lacey, Mohanty, Mohtar, Munster, Parnell, Riskowski, Singh, and Smith). Seven faculty members have expertise in renewable energy engineering (Capareda, Engler, Fernando, Lacey, Nikolov, Searcy, and Thomasson); seven have expertise in food and bioprocess engineering (Castell-Perez, Engler, Fernando, Gomes, Karthikeyan, Lacey, Moreira, and Nikolov); and three have machine systems expertise (Capareda, Searcy, and Thomasson). Note that several faculty members have expertise relevant to more than one emphasis area.

E. Faculty Size

1. Student-Faculty Interaction

All of our teaching faculty and some of our extension faculty interact regularly with departmental undergraduates outside of the classroom. The ASABE Pre-professional Club and the Aggie Pullers are very active student organizations, and faculty members regularly attend and participate in their meetings and social activities. These clubs benefit greatly from the faculty interaction and they have received several national recognitions. Many faculty members volunteer to advise student teams working on capstone design projects and help assess their presentations. Many students are hired as student employees to help with research and extension projects. This teaches students about the latest trends in a given area and allows good interaction with faculty on a one-to-one basis.

2. Student Advising and Counseling

Essentially all of our teaching faculty are involved with undergraduate student advising. Each faculty member advises 15-20 undergraduates and typically 12-14 of those are engineering students. Although faculty are always busy, they are very good about taking time to talk to students about career goals and other questions that students may have. The department also employs a full-time undergraduate academic advisor. Students are required to meet with their
faculty advisors once a semester to review their program as part of the pre-registration process. The academic advisor helps the students with many of their day-to-day issues and also assists the faculty in their academic advising duties.

3. Faculty Service Activities

Departmental faculty are expected to provide service to the department, college, university, and profession; and the department head reviews service activities each spring during each faculty member’s annual review. Typically this involves activities in standing and ad-hoc committees at all levels in the university system and in professional societies. Major contributions to university service by the 21 teaching faculty (tenured, tenure-track or lecturer) include two with service on the faculty senate, one with service on the College of Agricultural and Life Sciences promotion and tenure committee, one with service as a member of the TAMU Athletic Council and several that have served in cross-departmental search committees. All faculty members are involved in departmental level committees including curricula, infrastructure, recruiting and communications. All tenured faculty are members of the departmental level promotion and tenure committee.

4. Faculty Professional Development

The departmental faculty are active in professional development activities. They are very active in a variety of professional societies including ASABE, ASEE, AGU, SSBA, AIChE, ASHRAE, IFT, NSPE, and ASCE. Four of the current teaching faculty members are Fellows of ASABE. Most faculty are involved in professional society technical committees, with at least eight of them serving in leadership positions (chair, vice-chair, secretary) on these committees. Ten of the current teaching faculty are acting as editors or associate editors of professional journals, five have served on national proposal review panels, and three are serving as officers of professional societies. Several are also involved in national committees and task forces including the USDA Agricultural Air Quality Task Force, the USDA Multistate Research Committee on Controlled Environment Technology and Use, and the National On-Site Wastewater Recycling Association, and work closely with other experts in their areas. Seven faculty are regularly involved in teaching improvement activities including the annual TAMU Assessment Conference and workshops through the Center of Teaching Excellence at TAMU. At least three faculty have gone on faculty development leave in recent years. Many also travel regularly to international locations for professional meetings, lectures, and consulting.

F. Faculty

G. Faculty Development

Tenured faculty members are eligible to take Faculty Development Leave according to Texas A&M University guidelines. The Department does not have a specific policy beyond that of the University. Faculty members who wish to take a Faculty Development Leave must submit a request to the University through the Department Head and Dean. If approved, the faculty member continues to receive salary but is responsible for paying additional costs of the leave personally or from external funding sources. There also is a possibility to negotiate some travel funding from the College or Department. Additionally, as mentioned in Section E, BAEN
Faculty members have extensive development activities through scholarly work, conferences, international travel, presentations, and professional society involvement.
CRITERION 7. FACILITIES

A. Space

The department has good teaching and laboratory space and the equipment is adequate for the laboratory exercises that are performed in BAEN courses. The department has access to approximately 37,000 ft\(^2\) of space in Scoates Hall, 23,700 ft\(^2\) in the Hobgood Building, 18,000 ft\(^2\) in the AEPM Building, and 7,200 ft\(^2\) in the fabrication shop. This space is utilized to support all three of our missions (teaching, research and extension) but much of it is dedicated to teaching. In addition to the teaching-related facilities listed below, the students have an office for the engineering student club (AEPM 202).

As discussed under Criterion 8, we have a good support base for regularly upgrading teaching equipment and computing facilities. Many of the decisions for selecting equipment to upgrade or purchase are made by the Instructional Enhancement Funds Committee (departmental committee) which is comprised of faculty and student representatives from each of our undergraduate and graduate programs.

1. Offices (Administrative, Faculty, Clerical, Teaching Assistants)

Adequate office space is available for faculty, administrators, clerical staff and teaching assistants. The department has been renovating space for the ever-expanding numbers of graduate assistants, post-doctoral associates, research associates, and visiting scholars.

2. Classrooms

The department has limited classroom space which we control directly and one classroom controlled by the university for which we have priority. The department has complete control over Scoates 213 and 214 (Computer Labs), and Scoates 317 (54 seats). The department is given priority for use of Scoates 215 (35 seats) and the College of Liberal Arts has priority for use of Scoates 208 (100+ seats) and 216 (36 seats). These classrooms are equipped with computers, digital projectors, and switching equipment and are used for teaching most of the undergraduate engineering courses in our department. The department has three conference rooms controlled by the department, Scoates 305 (28 seats), Scoates 212 (10 seats), Scoates 307 (6 seats) and Hobgood 105 (20 seats), which are used for design project presentations and occasionally other teaching activities. The department also controls two classrooms, AEPM 203 (72 seats) and AEPM 104 (45 seats), on the west campus which are used primarily for teaching Agricultural Systems Management classes but occasionally BAEN classes. Many of our classes are taught in university-controlled classrooms located in other buildings across campus.

3. Laboratories

**Biological Engineering Teaching Laboratory (Scoates 237)** This room is an undergraduate teaching laboratory with equipment that can occasionally be used for research. It is equipped with an autoclave, laminar flow hood, fume hoods, incubator, shaker, waterbath, balances, spectrophotometer, distillation columns, freezer, and refrigerator. The Laboratory is used for lab assignments in BAEN 301 and 302 Biological and Agricultural Engineering Fundamentals I and II and BAEN 354 Properties of Biological Materials.
Biological Material Properties Laboratory (Scoates 144) This room is a combined teaching and research laboratory. It is used for teaching some laboratories for BAEN 354 Engineering Properties of Biological Materials and BAEN 422 Unit Operations in Food Engineering. Research activities include characterization of food, agricultural and biological materials for improved functionality, rheology of biopolymeric solutions, properties of packaging materials, and shelf-life studies. Pertinent equipment in the laboratory include a pycnometer for density of granular materials, moisture content and water activity meters, colorimeter, texture analyzers, differential scanning calorimeter, thermal conductivity and diffusivity unit, Brookfield viscometers, capillary viscometers, a falling ball viscometer, and a controlled stress rheometer.

General Student Computer Laboratory (Scoates 214) This 1300 ft² room has 24 computers, a scanner, and a laser printer. This lab is dedicated to teaching undergraduate courses that use computers and software, and for student use in completing class assignments. Some computers are upgraded each year with a complete rotation approximately every three years. An instructor’s console and digital projector are installed for teaching computer-intensive classes or laboratories. This room has card access and is available to departmental undergraduate students 24 h/day, 7 days/wk. Scoates Hall has wireless access for students, faculty, and staff.

Advanced Student Computer Laboratory (Scoates 213) The department has an additional computer laboratory (Scoates 213, 570 ft², 14 computers, printer, plotter, scanner) that is used primarily for advanced computing applications and teaching smaller computer-intensive classes.

Hobgood Computer Laboratory (Hobgood 118) This 375 ft² room has 12 computers and is used by undergraduate and graduate students and researchers on the west campus.

Mechatronics and Controls Laboratory (Scoates 318) This 935 ft² room is dedicated to teaching electronics, mechatronics, controls, and electricity courses. This laboratory has been used for one undergraduate engineering course, BAEN 370 Measurement and Control of Biological Systems and Agricultural Processes, and occasionally for other engineering courses. There are 12 workstations equipped with computers in this lab.

Food Engineering Laboratory (Scoates 316) This room is dedicated for teaching food and bioprocess engineering. Several undergraduate engineering courses use this laboratory: BAEN 422 Unit Operations in Food Processing, BAEN 265 Investigative Techniques for Biological and Agricultural Engineers, and BAEN 302 Biological and Agricultural Engineering Fundamentals II. Pertinent equipment in this laboratory include a concentric tube heat exchanger, HTSH pasteurizer, freeze dryer, tray dryer, texture analyzer, two Brookfield viscometers, capillary viscometers, a falling ball viscometer, balances, digital hygrometers, membrane filtration, and column chromatography.

Small Engines Teaching Laboratory (AEPM 108, 108a) This 4,440 ft² laboratory is used primarily by our AGSM students but is also used for part of BAEN 301 Biological and Agricultural Engineering Fundamentals I. It has twelve workstations and can handle 24 students at a time. Each workstation has a 5.5-hp overhead valve engine plus a tool set.

Student Project Fabrication Areas (AEPM 101, Shop) Wood working equipment, tools, and fabrication areas are located in AEPM 101 and are used for such projects as constructing items for BAEN 301 Biological and Agricultural Engineering Fundamentals I. The shop has metal working machinery and a fabrication area. The shop machinery is only operated by the shop supervisor or student employees who have been trained on the safe use of the equipment. The
shop equipment is primarily research related but is used for fabricating some parts of the ¼-scale tractor for the ASABE competition.

**Spatial Sciences Laboratory (Centeq Building)** This facility has a classroom with twelve computers and 24 student spaces, along with associated plotters and printers. It is used for teaching courses on GIS/GPS. A few of our engineering students will use this facility for AGSM 461 Geographic Information Systems for Resource Management.

**Research Laboratories Occasionally Used for Teaching**

**Water Quality and Hydraulics Laboratory (Hobgood 110 and 114)** This laboratory, with a total floor area of more than 2000 ft² is used primarily for research. The laboratory is equipped for conducting water quality research, and in particular for water treatment technology research and development. Major instruments and capabilities include Ion Chromatograph, Liquid Chromatograph, Gas Chromatograph, Mass Spectroscopy, Atomic Absorption Spectroscopy, Cold-Vapor Atomic Fluorescence Spectroscopy, Zeta-Potential/Particle Size Analyzer, Anaerobic Chamber and others. The lab also operates many bench-top scale water/wastewater treatment systems and one trailer-mounted pilot-scale water/wastewater treatment system for field demonstration. In addition, apparatus is available for measuring hydraulic conductivity.

Other research laboratories are available to students on an as-needed basis. These laboratory facilities include:

- Soil & Water Properties Laboratory (Scoates 141)
- Food Engineering Laboratories (314)
- Agricultural Air Quality Center Laboratory (Scoates 324)
- Engine Testing Laboratory (Hobgood 109 b, c, d)
- Alternative Fuels Testing Laboratory (Hobgood 109)
- Flexible Research Laboratory (Hobgood 115)
- Mechatronics and Controls Laboratory (Scoates 318)
- Cotton Ginning Technologies Laboratory (Hobgood 116)
- Biochemical Engineering Laboratory (Hobgood 108)
- Nanoscale Biological Engineering Laboratory (Scoates 147)

**B. Resources and Support**

1. Computing resources, hardware and software used for instruction

As described earlier, the department provides sufficient numbers of computers in the departmental computer laboratories. These laboratories are accessible only by departmental students and are always open. These laboratories have 62 computers and are heavily used by our students. The computers are connected to the departmental network and the internet. A printer is located in each laboratory and the students can access color printers and plotters. The computer laboratories are also popular meeting locations for student teams working on class assignments and design projects.

The department provides three computer labs in Scoates Hall and one in Price Hobgood for undergraduate and graduate students. All software is under site license by the department through the University Software Exchange Library (SELL) or directly with the vendor.
C. Major Instructional and Laboratory Equipment

A list of major instructional and laboratory equipment is provided in Appendix C.
CRITERION 8. SUPPORT

A. Program Budget Process and Sources of Financial Support

Although budgets are adjusted on an annual basis, the primary review of budgets and reallocations is on a bi-annual basis to coincide with the bi-annual assembly of the State legislature. Most of the funds supporting the department missions are in the Board of Regents approved budgets and come through the College of Agriculture and Life Sciences at Texas A&M University, and the two state agencies of Texas A&M AgriLife Research and Texas A&M AgriLife Extension Service. All of these are under the Texas A&M University System. Table 8-1 contains the budget allocations from Texas A&M University, which funds the teaching mission of the department. These are a combination of state appropriations and tuition revenue. This budget covers both undergraduate and graduate programs. The state’s budget downturn in FY12 resulted in a significant reduction that affected all activities. The increases in FY13 and FY14 were the result of receiving additional faculty positions. Funding for graduate teaching assistantships has continued a downward trend that began in 2008.

Table 8-1. Teaching budget from FY10 to FY14.

<table>
<thead>
<tr>
<th>TAMU</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Salaries</td>
<td>$1,442,856</td>
<td>$1,475,555</td>
<td>$1,244,909</td>
<td>$1,325,130</td>
<td>$1,556,239</td>
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<tr>
<td>Support Staff Salaries</td>
<td>$67,674</td>
<td>$70,075</td>
<td>$81,469</td>
<td>$168,250</td>
<td>$205,162</td>
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<td>Operating Budget</td>
<td>$93,775</td>
<td>$61,439</td>
<td>$61,446</td>
<td>$88,319</td>
<td>$118,262</td>
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<tr>
<td>Total Budget</td>
<td>$1,738,635</td>
<td>$1,741,399</td>
<td>$1,504,516</td>
<td>$1,698,391</td>
<td>$1,996,355</td>
</tr>
</tbody>
</table>

B. Sources of Financial Support

The department receives funds from a variety of sources. Faculty and staff salaries and some operating support are received through the College of Agriculture and Life Sciences (COALS), Texas A&M AgriLife Research, and Texas A&M AgriLife Extension Service. Our undergraduate teaching program is funded primarily through COALS, although many of our faculty and our staff are on joint appointments with Texas A&M AgriLife Research. We also receive funding for our undergraduate teaching program from student fees (about $373,000 annually) and endowments (about $37,000 annually). Support expenditures for the program are provided in Appendix D (Table D-3).

C. Adequacy of Budget

Institutional support to this program has been adequate. Faculty salaries are competitive and facilities are generally well maintained. The department has consistently placed in the top 20 in the country in terms of faculty positions and research expenditures. The department has received several top teaching awards and security grants. Currently, these awards are supported by the College of Agriculture and Life Sciences and the university for teaching excellence. We also have several endowed professorships that support the hiring of top faculty and advancement is dependent on high quality teaching.
The institution will continue to support departmental programs as in the past to maintain and upgrade facilities and salaries. In recent years, the institution has been replacing most teaching faculty vacancies, and it is anticipated that support will continue for this program. The department has added two new faculty in the last year, and we are hopeful that upcoming vacancies will be approved for refilling.

State budget appropriations to the department are not proportional to student numbers or credit hours taught. However, because of reductions in the COALS state-appropriated budget, portions of some staff salaries have been shifted to non-state-appropriated. Many of these shifts were made to funds obtained from student fees, which has reduced the funds available for support of laboratory equipment. The implementation of differential tuition charges for Engineering students has provided a source of funding that has partially offset the budget reductions, moderating the impact of those cuts. Operating budgets have ranged from 4-6% of the total budget, a ratio that is well below what is considered healthy.

D. Support of Faculty Professional Development

Faculty members are provided several opportunities for professional development. Excellent teaching seminars and lectures are offered regularly by COE, COALS, and the university. The university supports the Center for Teaching Excellence which regularly offers seminars on teaching and provides a service for videotaping and critiquing instructors. The department encourages participation in conferences and workshops that expand the knowledge and experience of faculty members, and have provided matching funds for travel to these events.

Our faculty members are heavily involved in research with an average of 31% of their salaries covered by research funding. Many faculty members also are requested to do consulting on a regular basis. They are generally recognized as leaders within their area of engineering specialization. Faculty members use extramural funding to allow them to travel and attend professional meetings. Many faculty members are invited to travel nationally and internationally allowing them to gain further knowledge in their areas of specialization.

E. Support of Facilities and Equipment

Funding levels for teaching facilities have generally been good. Part of the department’s budget from COALS is used for operation and maintenance. The COALS operating funds are used to support our teaching mission. Operating funds from Texas A&M AgriLife Research and Texas A&M AgriLife Extension Service are used primarily to help support our departmental research and extension missions, but they also indirectly support teaching related facilities. Departmental faculty members have been successful in receiving research grant funding, and some of the overhead charges are returned to the department to help maintain some of the general functions of the department. Many of the research facilities are also used for teaching departmental students via class laboratories, special projects, and undergraduate student employment.

The department has been receiving funds from four fees levied on students and these are used to support our teaching missions.

- Instructional Enhancement Fee (College Advancement Fee) ~$101,500 in FY14
- Computer Access Fee ~$3,000 in FY14
- Graduate Enhancement Fee ~$46,934 in FY14
• Differential Tuition - $221,655 in FY14

The amount of instructional enhancement fees depends on the number of students enrolled in departmental classes and these fees are allocated directly to the department. These funds are to be used only for teaching support and have been a major resource for maintaining and upgrading our teaching facilities. This money has been spent on teaching equipment, student computer lab upkeep and upgrades, software, and some technical support.

For FY15 and beyond, the Instructional Enhancement Fee has been replaced by a designated tuition charge entitled the College Advancement Fee. This change has been made to provide great flexibility to departments in the use of these funds. The current rates for the College Advancement Fee & Differential Tuition are $76 and $400, respectively, per student per semester. Twenty percent of the Differential Tuition fee is set aside for financial aid, so the income to the department is $300 per student per semester. The Computer Access and Graduate Enhancement Fee are unchanged. These funds are allocated partially by the department head for recurring costs and partially by a standing committee for special teaching equipment purchases. Many of the decisions for selecting equipment to upgrade or purchase are made by the Instructional Enhancement Funds Committee (departmental committee) which is comprised of faculty and student representatives from each of our undergraduate and graduate programs.

The funding from computer access fees is used only for upgrading computing equipment used directly by our students. Funding from graduate enhancement fees is used to support our graduate program in a manner similar to the instructional enhancement fees. The differential tuition funds are used to enhance undergraduate education.

The department has a number of endowments that are targeted for supporting our undergraduate program. Most are scholarships but some are for supporting student professional activities. The department has 16 endowed scholarship funds with a current market value of around $640,000 which generates around $34,000/year for student scholarships. There are also two endowed student enrichment funds with a current market value of around $55,100 and an endowed fund to support international activities for undergraduate students such as study abroad with a current market value of about $24,300. These funds provide about $2,500 annually to help support student organization activities and $1,000 annually to support international activities. Student organizations are also funded with $3,000 from the departmental operating funds. The students also obtain a significant amount of funding for ASABE Pre-professional Student Branch activities from fund-raising activities.

F. Adequacy of Support Personnel and Institutional Services

The department has ten administrative and technical staff:

1. Administrative assistant
2. Business administrators
3. Academic advisors
4. Lead office associate
5. Senior information technology professional
6. Technical laboratory coordinator
7. Part-time student assistant
There are several additional research staff who are supported on external research grants. Staff levels and abilities are adequate to support the department and faculty in meeting the basic needs of all of our missions. Staff members are very capable and are dedicated to working with our undergraduate students to enhance their educational experience. The academic advisors work full time with undergraduate and graduate students and handle many of the day-to-day needs of these students. The part-time student worker assists the academic advisors. The information technology professional spends much of his time ensuring that the student computer laboratory and the network system operate reliably. He also maintains the BAEN web page, which maintains information need by students for courses and advising. The technical laboratory coordinator works closely with faculty and students to help fabricate special items for classes and laboratories, as well as for student organizations.

The department also receives approximately $117,000 per year from COALS to support graduate students to assist faculty in teaching. This money is used to hire approximately six graduate teaching assistants per semester, which typically 50-70% of the total number assigned to faculty. The difference is covered by other funds, primarily student fees. Faculty who are teaching larger classes with laboratory sections are the most likely to have one of these graduate assistants assigned to their class. Due to the shortage of funds, some faculty members have received allocations for undergraduate student graders to assist with their courses.
CRITERION 9. PROGRAM CRITERIA

The BAEN program is designed to meet ABET program-specific criteria for both biological and agricultural engineering programs. Both sets of criteria have a curriculum component that is distinct and a faculty component that is the same. We will address each of these separately in this section.

A. Curriculum Component for Biological Engineering

The curriculum component for biological and similarly named engineering programs is stated below:

Programs must demonstrate that graduates have proficiency in mathematics through differential equations, a thorough grounding in chemistry and biology and a working knowledge of advanced biological sciences consistent with the program educational objectives. Competence must be demonstrated in the application of engineering to biological systems.

1. Mathematics

BAEN students complete a total of 14 credit hours of required courses in mathematics. These required courses encompass three semesters of engineering calculus and one semester of differential equations. In addition to the required mathematics courses, BAEN students complete three credit hours of mathematics or statistics elective. Students must achieve a grade of C or better in all required mathematics courses. Additionally, graduates taking the FE exam consistently achieve a higher percentage correct on the mathematics portion of the exam than students in the ABET/Carnegie comparator group. Thus, our graduates have demonstrated proficiency in mathematics.

2. Chemistry and Biological Sciences

BAEN students must take four credit hours of required introductory biology and three credit hours of introductory organic and biological chemistry. In addition, BAEN students must take BAEN 302 Biological and Agricultural Engineering Fundamentals II which focuses on advanced biological science and engineering including microbiology, microbial growth kinetics, enzyme kinetics, bioreactors and bioseparation processes. Finally, BAEN students are required to take BSEN 354 Properties of Biological Materials and BSEN 366 Transport Processes in Biological Systems. Students must achieve a grade of C or better in the BAEN courses which build on the basic knowledge obtained in the two introductory science courses.

We believe that these five required courses provide a thorough grounding in biological sciences and the working knowledge of advanced biological sciences to meet our educational objectives, particularly Objective 1) to produce graduates to serve the engineering needs of clientele in environmental and natural resources, machine and energy systems, food processing, bioprocessing, and agricultural production and processing and Objective 2) to produce graduates who are successfully employed in engineering jobs in industry, government, or academia.
3. Competence in Application of Engineering to Biological Systems

BAEN students first experience engineering application to biological systems in their freshman year, and this experience extends throughout the curriculum. During the freshman year (or the first year in the department for most transfers), students take BAEN 150 Introduction to Biological and Agricultural Engineering Design in which they develop a conceptual solution to a design problem presented by industrial or governmental clientele. These problems involve biological systems, agriculture, or natural resources. During the sophomore year, BAEN students take BAEN 301 Biological and Agricultural Engineering Fundamentals I and gain hands-on experience in the application of engineering to production of biofuels. During their junior year, BAEN students take BAEN 302 Biological and Agricultural Engineering Fundamentals II which includes engineering applications of microbiology, enzyme reactions, and bioseparations, and other required BAEN courses which include application of engineering to biological materials and transport processes. Seniors must complete a two-semester capstone design sequence and at least six credit hours of BAEN electives. At graduation, BAEN students will have completed required departmental courses throughout their curriculum that require application of engineering principles to biological systems. Students are required to attain at least a C in each of these engineering courses.

B. Curriculum Component for Agricultural Engineering

The curriculum component for agricultural and similarly named engineering programs is stated below:

Programs must demonstrate that graduates have proficiency in mathematics through differential equations and in biological and engineering sciences consistent with the program educational objectives. Competence must be demonstrated in the application of engineering to agriculture, aquaculture, forestry, human, or natural resources.

1. Mathematics

See statement above under the curriculum component for biological engineering programs.

2. Biological and Engineering Sciences

BAEN students are required to take four credit hours of introductory biology and three credit hours of introductory organic and biological chemistry. In addition, BAEN students must take six sophomore level courses covering basic engineering sciences and a core of seven junior level BAEN courses covering additional engineering sciences and applications to biological and agricultural systems. Students must achieve a grade of C or better in all courses beyond the introductory level.

We believe that these required courses provide a thorough grounding in biological and engineering sciences to meet our educational objectives, particularly Objective 1) to produce graduates to serve the engineering needs of clientele in environmental and natural resources, machine and energy systems, food processing, bioprocessing, and agricultural production and processing and Objective 2) to produce graduates who are successfully employed in engineering jobs in industry, government, or academia.

3. Competence in Application of Engineering to Agriculture and Natural Resources
BAEN students first experience engineering application to agriculture and natural resources in their freshman year, and this experience extends throughout the curriculum. As described above, in BAEN 150 Introduction to Biological and Agricultural Engineering Design students work on design problems involving biological systems, agriculture, or natural resources. During the sophomore year, BAEN students take BAEN 301 Biological and Agricultural Engineering Fundamentals I and gain hands-on experience in the application of engineering to power transmission, plant production and harvesting, animal production, air quality, and water quality. During their junior year, BAEN students take a sequence of six required core department courses which include engineering applications to fluids, biological materials, agricultural machinery and structures, unit operations, measurement and control systems, and transport processes. Seniors must complete a two-semester capstone design sequence and at least six credit hours of BAEN electives. At graduation, BAEN students will have completed at least 34 hours of departmental courses throughout their curriculum that require application of engineering principles to agriculture or natural resource problems. Students are required to attain at least a C in each of these engineering courses.

C. Faculty Component

The faculty component of both the biological and the agricultural engineering program criteria is the same and is stated below:

*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.*

BAEN faculty members have engineering expertise in soil and water resources, air quality, food engineering, bioprocessing, machine systems, and bioenvironmental systems (structural design and environmental control). There are 18 faculty members who teach in the BAEN undergraduate program, and all have PhDs in their area of expertise. Of these 16 faculty members, 14 are licensed professional engineers and one additional faculty member is working toward professional registration. Several of the faculty members also have some level of experience in non-academic positions. All teaching faculty have strong research programs in their respective areas of expertise and publish scientific and scholarly work on a regular basis.
APPENDIX C – LABORATORY EQUIPMENT
Appendix C  Laboratory Equipment

Unit operations

Psychrometric measurement instruments
(Davis perception II, psychrodyne, weather station)
Vane flow meter
Hotwire anemometers
Pitot tubes
Orifice meters and magnehelics
Mass flow controllers/meters
Laminar flow elements
Fan systems
10 ft. auger system with feed hopper and power meter
Cyclone testing system
Dust explosion chambers
10 ft. belt conveyor with feed hopper and power meter

Machine systems and energy

Psychrometer
Oxygen bomb calorimeter
Spark ignition (SI) engine
Compression ignition (CI) engine
Hydraulics trainer
Pneumatics trainer
High performance liquid Chromatograph
Environmental chamber and biogas production set-up
Pilot fluidized bed gasifier
Pilot mobile pyrolysis unit
Engine dynamometer
Autoclave and incubators
Bioflo 110 fermentor
Solar concentrating collector
1kW wind aerogenerator
Biodiesel production unit
Hydrogen fuel cell set-up
Tensile tester
3D printers

Food and bioprocess engineering

Food texture analyzers
Brookfield viscometers
Falling ball viscometer
Yield stress rheometer
Controlled Stress rheometer
Helium pycnometer
Hunter colorimeter
Flask calorimeters
Differential scanning calorimeter
Thermal conductivity probe
Water activity unit
Drying ovens
Desiccators with salt solutions
Eppendorf centrifuge
Fisher Scientific microcentrifuge
BD centrifuge
IC centrifuge
Vortex Gene 2 for DNA work
Vortex Gene 2 for E. coli work
Vortex Gene (general purpose)
New Brunswick Gyrotary shaker
Eberbach reciprocating shaker
Fisher Scientific Isotemp Incubator
Precision waterbath
Eppendorf research grade micropipettes
Vacuum pump
Vacuum manifold
Beckman pH meter
Sanyo autoclave
Level II Laminar Flow Hood
Fume hood
Fisher Scientific gel electrophoresis system
Fotodyne gel imager
Light microscope
Eppendorf ep gradient PCR thermocycler
Millipore DNA/DNase free water purification system
Psychrometers
Fisher Scientific Spectrophotometer
Membrane filtration system
Labconco Freeze Dryer Vortex
Hot plates
Haugh units tester
Tray dryer
Analytical balance

Nanotechnology

Gas chromatograph
GC mass spectrometer
Particle sizer/Zeta sizer
Atomic force microscope

85
Appendix C

Laboratory Equipment

Refrigerator
Freezer
Mufla
Pasteurizer
Vacuum fryer
APPENDIX D – INSTITUTIONAL SUMMARY BAEN TABLES
Table D-3. Support Expenditures*

Biological and Agricultural Engineering

<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Expenditure Category</td>
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<td></td>
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<tr>
<td>Operations (not including staff)(^4)</td>
<td>$121,361</td>
<td>$115,256</td>
<td>$176,923</td>
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<tr>
<td>Travel(^5)</td>
<td>$11,106</td>
<td>$21,882</td>
<td>$106,054</td>
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<tr>
<td>Equipment(^6)</td>
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<td></td>
</tr>
<tr>
<td>(a) Institutional Funds</td>
<td>$121,644</td>
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<td>$98,825</td>
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<tr>
<td>(b) Grants and Gifts(^7)</td>
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<td></td>
</tr>
<tr>
<td>Graduate Teaching Assistants</td>
<td>$117,306</td>
<td>$134,264</td>
<td>$150,509</td>
</tr>
<tr>
<td>Part-time Assistance(^8) (other than teaching)</td>
<td>$74,371</td>
<td>$86,229</td>
<td>$83,040</td>
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<tr>
<td>Faculty Salaries</td>
<td>$1,455,533</td>
<td>$1,403,529</td>
<td>$1,739,944</td>
</tr>
</tbody>
</table>

* Data provided in these tables reflects funding from academic sources only (except for the Grants and Gifts line item).

Report Department Level and Program Level data for each program being evaluated. Updated tables are to be provided at the time of the visit.

1 Provide the statistics from the audited account for the fiscal year completed year prior to the current fiscal year.
2 This is your current fiscal year (when you will be preparing these statistics). Provide your preliminary estimate of annual expenditures, since your current fiscal year presumably is not over at this point.
3 Provide the budgeted amounts for your next fiscal year to cover the fall term when the ABET team will arrive on campus.
4 Categories of general operating expenses to be included here.
5 Institutionally sponsored, excluding special program grants.
6 Major equipment, excluding equipment primarily used for research. Note that the expenditures (a) and (b) under “Equipment” should total the expenditures for Equipment. If they don’t, please explain.
7 Including special (not part of institution’s annual appropriation) non-recurring equipment purchase programs.
8 Do not include graduate teaching and research assistant or permanent part-time personnel.
### Table D-4. Personnel and Students

**Biological and Agricultural Engineering**

**Year**: Fall 2013

<table>
<thead>
<tr>
<th>HEAD COUNT**</th>
<th>FTE(^2,7)</th>
<th>RATIO TO FACULTY(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FT</strong></td>
<td><strong>PT</strong></td>
<td></td>
</tr>
<tr>
<td>Administrative(^4)</td>
<td>1 0</td>
<td>0.37</td>
</tr>
<tr>
<td>Faculty (tenure-track)</td>
<td>19 0</td>
<td>9.52</td>
</tr>
<tr>
<td>Other Faculty (excluding student Assistants)</td>
<td>2 2</td>
<td>1.49</td>
</tr>
<tr>
<td>Student Teaching Assistants</td>
<td>13 0</td>
<td>13.0 1.18</td>
</tr>
<tr>
<td>Student Research Assistants</td>
<td>25 0</td>
<td>25.00 2.27</td>
</tr>
<tr>
<td>Technicians/Specialists</td>
<td>1 0</td>
<td>0.15 0.01</td>
</tr>
<tr>
<td>Office/Clerical Employees</td>
<td>6 0</td>
<td>1.93 0.175</td>
</tr>
<tr>
<td>Other Computer Tech(^5)</td>
<td>1 0</td>
<td>0.80 0.07</td>
</tr>
<tr>
<td>Other Advising</td>
<td>2 0</td>
<td>2.00 0.18</td>
</tr>
<tr>
<td>Undergraduate Student enrollment(^6)</td>
<td>217 8</td>
<td>201.5 18.3</td>
</tr>
<tr>
<td>Graduate Student enrollment(^7)</td>
<td>58 19</td>
<td>73.2 6.64</td>
</tr>
</tbody>
</table>

**The head count for faculty, student assistants, technicians, staff, etc. does not include that portion supported by external research funding.**

<table>
<thead>
<tr>
<th>FT</th>
<th>PT</th>
<th>FTE</th>
<th>RATIO TO FACULTY</th>
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<tr>
<td>1</td>
<td>0</td>
<td>0.37</td>
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</tr>
<tr>
<td>19</td>
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<tr>
<td>2</td>
<td>2</td>
<td>1.49</td>
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<td>0</td>
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<td>0.01</td>
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<td>6</td>
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<td>8</td>
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</tr>
<tr>
<td>58</td>
<td>19</td>
<td>73.2</td>
<td>6.64</td>
</tr>
</tbody>
</table>

Report data for the program unit(s) and for each 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. Divide FTE in each category by total FTE Faculty. Do not include administrative FTE.

4. 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.

5. Specify any other category considered appropriate, or leave blank. *This includes Graduate Assistant Non-Teaching students (GANT)*. 20 hours/week = 1 FTE

6. Specify whether this includes freshman and/or sophomores. *Includes lower and upper level students, i.e., freshmen + sophomores, juniors and seniors.*

7. For Graduate Student enrollment, the Dwight Look College of Engineering considers full time enrollment to be 9 semester credit hours; therefore, FTE for Graduate Student enrollment is calculated using 9 semester credit hours (not 15 sch).
Table D-5. Program Enrollment and Degree Data

 Biological and Agricultural Engineering

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Enrollment Year</th>
<th>Total Undergrad</th>
<th>Total Grad</th>
<th>Degrees Conferred</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>4th</td>
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<tr>
<td>CURRENT 13-14</td>
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<td>60</td>
<td>52</td>
<td>41</td>
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<td></td>
<td>PT</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12-13</td>
<td>FT</td>
<td>64</td>
<td>46</td>
<td>40</td>
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<td>11-12</td>
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<td>3</td>
<td>2</td>
</tr>
<tr>
<td>10-11</td>
<td>FT</td>
<td>51</td>
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<td>08-09</td>
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<td>29</td>
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<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

* Degrees Conferred are for the AY indicated in the "Academic Year" column;
i.e., Degrees Conferred for AY 2009 include fall 2008, spring 2009 and summer 2009 degrees granted.

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time   PT--part time
Table D-6. Faculty Salary Data

Academic Year 2013-2014

Biological and Agricultural Engineering Department

<table>
<thead>
<tr>
<th></th>
<th>Professor</th>
<th>Associate Professor</th>
<th>Assistant Professor</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>13</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>$ 195,000</td>
<td>$ 113,496</td>
<td>$ 96,513</td>
<td>$ 85,646</td>
</tr>
<tr>
<td>Mean</td>
<td>$ 147,253</td>
<td>$ 95,491</td>
<td>$ 85,774</td>
<td>$ 80,034</td>
</tr>
<tr>
<td>Low</td>
<td>$ 115,539</td>
<td>$ 85,521</td>
<td>$ 75,036</td>
<td>$ 75,414</td>
</tr>
</tbody>
</table>

- All salaries are for 12-months.
- Salaries include Department Head, chaired professors and distinguished professors.
Agricultural Systems Management
Curriculum Self Study

Biological and Agricultural Engineering Department
Texas A&M University

Materials submitted for review by the Agricultural Technology and Management Curriculum Review and Program Recognition Committee (P-206)

American Society of Agricultural and Biological Engineers

Updated for the Academic Program Review
February, 2015
Executive Summary

Agricultural Systems Management (AGSM) is a non-engineering undergraduate degree program offered by the Biological and Agricultural Engineering Department. The AGSM curriculum features strong preparation in engineering technology and business principles with applications to complex systems including agriculture in the broadest sense. Currently 135 undergraduate students are currently enrolled in the AGSM program.

Our AGSM undergraduate curriculum undergoes peer-review for formal recognition. This review is conducted by a committee within the American Society of Agricultural and Biological Engineers (ASABE) comprised of representatives from peer programs across the US. Our last review was conducted in 2006, yielding a six-year recognition renewal, the maximum possible.

We have modified one course and created three courses to the catalog of AGSM course offerings as electives. AGSM 201 has historically focused on internal combustion engine theory and operation, with the lab concentrating on the disassembly and reassembly of a small lawnmower engine. This has been reduced while theory and application of other power and energy systems (hydraulics, electrical, wind and solar) have been added. To fulfill our requirement for an advanced computer elective, AGSM 489 (3-0) was introduced in 2014 as a special topics course in Project Management. In 2015, this course has been named AGSM 473. This course builds upon the project management fundamentals introduced in AGSM 301 and focuses on computer application in project management. Microsoft Project Manager software is used extensively, which prepares students to use computer software in project management applications. AGSM 355 and AGSM 435 have also been added and are described in the course listing section.

To further bolster student quality, we have a Common Body of Knowledge (CBK) requirement for AGSM students. Students must achieve a grade of C or better in the following courses:

- ACCT 209 Survey of Accounting Principles
- AGSM 301 Systems Analysis in Agriculture
- CHEM 107 General Chemistry for Engineering Students
- ECON 202 Principles of Economics
- MATH 141 Business Mathematics I
- MATH 142 Business Mathematics II
- PHYS 201 College Physics

In 2014, AGSM 439 and 440 were added to the CBK. These two “Capstone” courses represent the integration of all aspects of the curriculum.

This report generally follows the format requested for ASABE program recognition. Additional information regarding the AGSM undergraduate program is available upon request.
Agricultural Systems Management  
Undergraduate Program

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General Information

Program History

The curriculum in Agricultural Systems Management (AGSM) at Texas A&M University evolved in 1988 from a curriculum in Mechanized Agriculture first established in 1967. When the program was revised, the faculty of the Department of Biological and Agricultural Engineering chose to emphasize systems concepts in the curriculum to better educate graduates to manage people, money, and machines in the food and agricultural industries.

The AGSM Curriculum Committee, appointed by the department head, is responsible for supervision of all aspects of the program. The curriculum is continuously examined. Changes have kept the requirements within guidelines of the American Society of Agricultural and Biological Engineers (ASABE) and – most importantly – have responded to technological and managerial advances. Supporting courses offered by other departments in the university that are required in the curriculum also have been revised or changed to meet the demands of changing job requirements.

Goals and Objectives

Graduates of the AGSM program are typically employed as production or processing operations managers, equipment managers, or in technical sales and services. Employers include farm and industrial equipment companies, food processing plants, cotton gins, grain and seed companies, livestock feeding operations, irrigation companies, construction companies, manufacturers, and a variety of other employers who need technical managers. In these positions, our graduates need the skills to integrate technical knowledge, business/financial expertise, and communication abilities.

The goal of the AGSM curriculum is to provide an educational experience that prepares our graduates for a productive career. Educational outcomes for the AGSM undergraduate curriculum include:

- **Problem Solving**: AGSM graduates can apply systems analysis, engineering technology, and business concepts to solve complex problems to meet the needs of a diverse and international clientele.
- **Communication**: AGSM graduates will be able to effectively communicate with clientele and other stakeholders in an audience-appropriate manner.
- **Teaming**: AGSM graduates will effectively function in teams and will appreciate the unique and diverse background, knowledge, and perspective each member brings to the team.
- **Self-learning**: AGSM graduates will be able to locate, critically evaluate, and apply new information and technologies.

In 2007, we implemented a quality enhancement plan for the AGSM undergraduate curriculum that includes assessment of student performance metrics based on these educational
outcomes. These assessment procedures use data from two direct (student performance in the capstone courses and student performance on assignments in key required courses) and two indirect (student surveys and exit interviews with graduating seniors) sources. Each of these assessment methods addresses all four of the AGSM educational outcomes. Assessment data will be evaluated as part of our continuous curriculum improvement process.

**Student Enrollment**

Fall semester enrollment in the AGSM program for the past five years is summarized in Table 1.

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Undergraduates</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>127</td>
<td>3</td>
</tr>
<tr>
<td>2010</td>
<td>136</td>
<td>2</td>
</tr>
<tr>
<td>2011</td>
<td>133</td>
<td>2</td>
</tr>
<tr>
<td>2012</td>
<td>144</td>
<td>4</td>
</tr>
<tr>
<td>2013</td>
<td>147</td>
<td>2</td>
</tr>
</tbody>
</table>

**Student Academic Distribution**

Very few AGSM students enter the program as first-time freshman (Table 2). The majority transfer in from other majors on campus (approximately 80%) or from other institutions (approximately 20%). On-campus transfers have an average GPA of 2.5 and largely come from either Biological and Agricultural Engineering, programs within the Dwight Look College of Engineering, or general studies. Off-campus transfers have an average GPA of 2.9 and enter from both 2-year and 4-year campuses across Texas. A result of obtaining students primarily by transfer is that the distribution of students is heavily skewed to the upper level classifications.

<table>
<thead>
<tr>
<th>Fall Semester Enrollment</th>
<th>Freshmen</th>
<th>Sophomores</th>
<th>Juniors</th>
<th>Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>4</td>
<td>19</td>
<td>41</td>
<td>63</td>
</tr>
<tr>
<td>2010</td>
<td>7</td>
<td>10</td>
<td>38</td>
<td>81</td>
</tr>
<tr>
<td>2011</td>
<td>6</td>
<td>22</td>
<td>34</td>
<td>71</td>
</tr>
<tr>
<td>2012</td>
<td>15</td>
<td>27</td>
<td>41</td>
<td>61</td>
</tr>
<tr>
<td>2013</td>
<td>9</td>
<td>32</td>
<td>34</td>
<td>72</td>
</tr>
</tbody>
</table>
Graduation Rates

Graduation rates for the AGSM program over the past five academic years are summarized in Table 3. On average, approximately one third of the total AGSM enrollment graduates each year, a result of the heavy weighting toward seniors.

Table 3. Undergraduate and graduate degrees awarded in AGSM.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Bachelor of Science</th>
<th>Master of Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2010</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>2010-2011</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>2011-2012</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>2012-2013</td>
<td>35</td>
<td>2</td>
</tr>
<tr>
<td>2013-2014</td>
<td>41</td>
<td>2</td>
</tr>
</tbody>
</table>

Employment and Compensation

Employment options for AGSM graduates have been excellent, with a number of employers contacting the department with opportunities and coming to the department specifically to interview our students. Table 4 includes a listing of first employment for recent B.S. graduates. Starting salaries for the past year ranged from $28,000 to $75,000. Benefits offered by employers are not always provided.
Table 4. Companies hiring recent AGSM B.S. graduates.

<table>
<thead>
<tr>
<th>ACME Brick Company</th>
<th>Ferguson Cooperatives</th>
<th>Military Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM</td>
<td>Ferguson Enterprises</td>
<td>Mine Service Inc.</td>
</tr>
<tr>
<td>American Superior Feed</td>
<td>Ferguson Int. Plumbing</td>
<td>Mustang Rental</td>
</tr>
<tr>
<td>All Surface Interior</td>
<td>Ford Motor Credit</td>
<td>Newmark Homes</td>
</tr>
<tr>
<td>American Express Finance</td>
<td>Fort Bend Services, Inc.</td>
<td>North Field Enterprises</td>
</tr>
<tr>
<td>Asgro Seed Co.</td>
<td>Frito lay</td>
<td>Orion</td>
</tr>
<tr>
<td>Battery Concepts Intl., Inc.</td>
<td>Garrett Mechanical</td>
<td>Paper Pro/Bayou Hickerson</td>
</tr>
<tr>
<td>Ben E. Keith Co.</td>
<td>Gas Compression Co.</td>
<td>Pilgrim’s Pride</td>
</tr>
<tr>
<td>Bluebell</td>
<td>General Homes</td>
<td>Powell Industries</td>
</tr>
<tr>
<td>Cactus Feeders</td>
<td>Gilbert TX Construction</td>
<td>RDO Equipment</td>
</tr>
<tr>
<td>The Capital Group</td>
<td>Gooseneck</td>
<td>Royce Homes</td>
</tr>
<tr>
<td>Cargill, Inc.</td>
<td>Graduate/Professional School</td>
<td>RWT Land Services</td>
</tr>
<tr>
<td>Carrier</td>
<td>Grant Country Feeders</td>
<td>Ryland Homes</td>
</tr>
<tr>
<td>Carson Supply Company</td>
<td>Halliburton Energy</td>
<td>S &amp; B Engineers</td>
</tr>
<tr>
<td>Centex Homes</td>
<td>Hanson Concrete</td>
<td>Samuel Jackson, Inc.</td>
</tr>
<tr>
<td>Central Turf Farms, Inc.</td>
<td>HEB Grocery</td>
<td>Sanderson Farms</td>
</tr>
<tr>
<td>Chamberlain</td>
<td>Hertz</td>
<td>Satake USA</td>
</tr>
<tr>
<td>Champion Construction</td>
<td>Hog-Slat</td>
<td>South Texas Implement Co.</td>
</tr>
<tr>
<td>Champion Technologies</td>
<td>Holt Caterpillar</td>
<td>Spaw Glass Contractors</td>
</tr>
<tr>
<td>Cimarron Feeders</td>
<td>Honda</td>
<td>TD Industries</td>
</tr>
<tr>
<td>Cintas Corporation</td>
<td>Insituform Technologies</td>
<td>Temple-Inland</td>
</tr>
<tr>
<td>Collingwood Grain</td>
<td>Inspirations</td>
<td>Texas Cooperative Extension</td>
</tr>
<tr>
<td>Colorado Beef</td>
<td>Insurance Info Exchange</td>
<td>Texas Cotton Ginters Assoc.</td>
</tr>
<tr>
<td>Compressor Systems</td>
<td>The Integer Group</td>
<td>Texas Engineering Exp. St.</td>
</tr>
<tr>
<td>Consolidated Gin</td>
<td>Interlant</td>
<td>Texas Utility Mining</td>
</tr>
<tr>
<td>Cornerstone Retail Solutions</td>
<td>Jeld-Wen</td>
<td>Tru geen</td>
</tr>
<tr>
<td>Cullen Ranch</td>
<td>John Deere Co.</td>
<td>Tyson Foods, Inc.</td>
</tr>
<tr>
<td>Dallas Emergency Services</td>
<td>JP Morgan Chase</td>
<td>UAP Southwest</td>
</tr>
<tr>
<td>DCMC—Project Manager</td>
<td>K2Share</td>
<td>United Agri. Products</td>
</tr>
<tr>
<td>Diamond D</td>
<td>Kimball Hill Homes</td>
<td>UPS</td>
</tr>
<tr>
<td>Dynamic Systems, Inc.</td>
<td>Koppers Industries</td>
<td>Vernon Henkes Farm</td>
</tr>
<tr>
<td>Eco-Drip Irrigation</td>
<td>La Brisa</td>
<td>Vulcan</td>
</tr>
<tr>
<td>EMESA</td>
<td>Lankmark Structures</td>
<td>Walkasaw</td>
</tr>
<tr>
<td>Encompass</td>
<td>Layne’s</td>
<td>Wilbur Ellis Co.</td>
</tr>
<tr>
<td>Family Farming Operations</td>
<td>Lonnie Lischka Co., Inc.</td>
<td>Woodside Wholesale</td>
</tr>
</tbody>
</table>
Curriculum and Program Information

Freshman Admissions

Freshmen are admitted to Texas A&M University (Texas A&M) based on high school ranking, SAT or ACT score, and other criteria as discussed in the undergraduate catalog. The Office of Admission and Records decides which students are to be admitted into Texas A&M. Generally, freshman admission to the university falls into three categories: top 10% from Texas high schools, academic admits, and other applications.

**Top 10% from Texas High Schools**—Students in the top 10% of their graduating class from recognized Texas public or private high schools are automatically admitted into Texas A&M. While these students are not guaranteed admission into their first-choice major, they do have preference for major choice if their admission application is complete prior to the early admission deadline.

**Academic Admits**—Automatic admission to domestic applicants is granted to in-state students who achieve a score of 1300 (minimum score of 600 in math and critical reading) on the SAT or 30 on the ACT (minimum score of 27 in math and English), place in the top 25% of their graduating class, and meet minimum high school course requirements. Automatic admission based on academics does not guarantee students their choice of major. Preference for major choice is given to those students who file a complete application before the early admission deadline.

**Other Applications**—Students not admitted through the first two categories are evaluated on a case-by-case basis. Factors considered in these admission decisions include the student’s progress and academic record on required high school preparatory courses, their class rank in combination with their score on the SAT or ACT, evidence of leadership and/or service work as indicated in their application packet, and their application essay.

The department does not have an opportunity to participate in the decision process for admission of new freshmen. Once a freshman is admitted to the university, they have the option to change major to any program that is not restricted by enrollment management up to the time of their summer conference. The AGSM program is not impacted by enrollment management since students enter through the College of Agriculture and Life Sciences. After an incoming freshman registers, they cannot change major until after grades for the semester have been posted.

Transfer Admissions

The minimum requirement for transfer students seeking admission to Texas A&M is a grade point ratio (GPR) of 2.5/4.00 on at least 24 graded hours of transferable courses at the time of application. For transfer admission into AGSM, students should complete appropriate course work listed in the degree track tables published in the undergraduate catalog including English composition, technical writing, public speaking, chemistry, physics, business math, history, political science, and economics.
The Office of Admissions and Records decides whether transfer applicants are qualified for admission into the university. Qualified transfer application packets are routed to the college and department offering the prospective student’s major of choice. In addition to meeting minimum university requirements, students seeking admission into AGSM must show potential in mathematics, science, and business based on evaluation of their transcript (grades of C or better in related courses).

Acceptance of Transfer Credits

Texas A&M transfer credit policy is published annually in the undergraduate catalog and in Texas A&M University Student Rules. Generally, transfer credit evaluation falls into four categories: courses listed in the Texas Common Course Numbering System, equivalent courses taken at other institutions, distance and correspondence courses, and course credit earned by examination.

Texas Common Course Numbering System—The Texas Common Course Numbering System is supported by a collaboration of over 100 Texas community colleges and universities and is intended to facilitate transfer of general education courses at the freshman and sophomore levels. Courses taken at one participating system institution will transfer to another system institution based on established course equivalency guidelines. A listing of Texas A&M courses coordinated with the Texas Common Course Numbering System and their system equivalents is provided in the undergraduate catalog.

Equivalent Courses Taken at Other Institutions—The Office of Admissions and Records takes primary responsibility of evaluating equivalency of courses taken at other institutions. Courses for which transfer credit is requested must be applicable to a degree offered at Texas A&M, be similar to a course offered for degree credit, and have content at or above the beginning-most course offered in that subject at Texas A&M. The Office of Admissions and Records evaluates equivalency of course content using the catalog description and/or the course syllabus. If the Office of Admissions and Records cannot determine equivalency of a transfer course, the department offering similar subject matter at Texas A&M is asked to determine equivalency.

In general, transfer credit is given for courses successfully completed at accredited institutions. Credit may be given for courses taken at non-accredited institutions if the student maintains at least a 2.00/4.00 GPR for their first 30 hours of course work completed at Texas A&M. Courses from international institutions are evaluated by the Office of Admissions and Records on a case-by-case basis.

For students in the College of Agriculture and Life Sciences, transfer credit for courses at the junior and senior level may be used toward degree requirements only with approval of the department head and dean. For AGSM students, the Advising Coordinator evaluates transfer of upper-division credit and makes recommendations regarding such approval.
Distance and Correspondence Courses—Texas A&M students may apply up to 30 credit hours of distance education including up to 12 hours of correspondence credit from accredited institutions towards degree requirements. Transfer of credit earned via distance or correspondence credit is subject to the same rules as equivalent courses taken at other institutions.

Course Credit Earned by Examination—Students receiving course credit by examination at another institution may transfer that credit to Texas A&M if they have successfully completed sequential course work in the same subject or if the credit is part of the student’s degree plan at the other institution. All credit earned by examination must conform to the requirements for regular courses taken at other institutions.

Admission to the AGSM Program

Freshman Admits—Criteria for freshman admission to AGSM are the same as for admission to Texas A&M. All admitted students who desire to major in AGSM are accepted. Current students who wish to change majors into AGSM are individually evaluated for their qualifications and interest. Students with less than a 2.0 grade point ratio are occasionally accepted, particularly if they are coming from engineering programs.

Off-Campus Transfers—Transfer applicants are evaluated by the AGSM program coordinator and acceptance or rejection is determined within the department. All Texas A&M transfers are required to have completed at least 24 hours at another institution. The following are the criteria for acceptance provided to prospective transfers:

- Completion of MATH 141 and CHEM 101/111 or 107/117 equivalents (MATH 1324 and CHEM 1411, 1410, or 1470 in the Texas Common Course Numbering System)
- Completion of MATH 142, ACCT 229, ECON 202 and ECON 203 equivalents is desirable and aids in evaluation
- GPA targets for acceptance are 2.75 with B’s or better in MATH 1324 and CHEM 1411/1410/1470, or 3.0 with C’s in either of these courses

On-Campus Transfers (Change of Major)—Since the AGSM curriculum is heavy in science, mathematics, engineering technology, and business, we evaluate potential transfer students on performance in related courses rather than their overall GPA. In particular, we look for performance in calculus, chemistry, physics, lower-level engineering, economics, and accounting. Because we look at indicators other than overall GPA, we do occasionally accept students with academic deficiency. Typically, these are lower-level engineering students who have retaken calculus or physics, sometimes more than once. Students entering the major below 2.0 are given approximately two semesters to regain good academic standing.

Other Related Programs

Cooperative Education—The Texas A&M Career Center supports students seeking opportunities for cooperative education, internships, and work abroad experiences. While many AGSM students participate in informal summer internships, relatively few take advantage of
formal cooperative education programs. Many AGSM courses are offered only once per year. Students who take a semester off for cooperative education often must delay graduation by one full year to make up missed courses. In addition, because so many students transfer into AGSM with many hours already completed, most are not interested in extending the time required to complete the degree. At most, we will have one or two AGSM students per year in a cooperative education experience.

**Study Abroad**—Starting in 2004, two AGSM courses, AGSM 335 Soil and Water Management and AGSM 337 Technology for Environmental and Natural Resources Management, have been offered during the second summer term as a study abroad course. This study abroad is hosted at the Katholieke University of Leuven, in Leuven, Belgium. Approximately 20 students, primarily from the College of Agriculture and Life Sciences, participate in this program each summer.

**Texas Cotton Ginners Association (TCGA) Internship Program**—In 2008, the TCGA asked the department for a summer intern to work in two of its member gins, one in West Texas and another in the Gulf Coast region. The intent of the program is to attract, recruit, and retain quality AGSM students who will begin to replace the population of aging cotton gin managers. Interns have been successfully placed each year, with the requested number increasing to two in 2010 to present. Students interested in participating in the Dealership Management Program must meet the following qualifications and program requirements:

- Major in Agricultural Systems Management (AGSM).
- Complete two semesters of coursework at Texas A&M
- Have a 2.5 or greater GPA
- Make a formal application to participate in the program
- Interview with TCGA prior to selection

The TCGA Internship offers AGSM students exposure to two prominent geographic areas of cotton production. The first 6 weeks of the internship is conducted at a cooperating gin in the Lubbock area, before harvest begins, to allow the intern to become familiar with that environment as well as gin maintenance and economics. The remaining portion of the internship is conducted at a cooperating gin in the Corpus Christi area to allow the intern to participate in actual ginning activity. Upon graduation, there is no commitment either for the internship host gins to offer a position or for the student to accept an employment offer from a gin. In practice however, placement rates of a TCGA intern in the cotton industry has been in excess of 75%. TCGA contributes to the Biological and Agricultural Engineering Department Cotton Engineering Chair and also provides much assistance for team projects for our capstone classes.
Subject Matter Distribution

Table 5 presents distribution of credit hours and percent of total required hours amongst various topics.

<table>
<thead>
<tr>
<th></th>
<th>Credit Hours</th>
<th>% of Degree Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities &amp; Social Sciences</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Composition and Communications</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Mathematics</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Business and Management Sciences</td>
<td>24-27</td>
<td>19-21</td>
</tr>
<tr>
<td>Agricultural Systems Management</td>
<td>42</td>
<td>33</td>
</tr>
<tr>
<td>Technical Agriculture</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Electives</td>
<td>9-12</td>
<td>7-9</td>
</tr>
</tbody>
</table>

Curriculum in Agricultural Systems Management

Graduates of the Agricultural Systems Management program manage people, money and machines in the food and agricultural industries. They are typically employed as production or processing operations managers, equipment managers, or in technical sales and services. Employers include farm and industrial equipment companies, food processing plants, cotton gins, grain and seed companies, livestock feeding operations, irrigation companies, construction companies, manufacturers, and a variety of other employers who need technical managers.

The technological courses are applications-oriented and focus on practical experience in food processing systems, water management, machinery and power systems, electrical systems and electronics. Business courses include accounting, economics, marketing, management, law and finance. A student may obtain a minor in business by selecting courses that fulfill both business minor and AGSM requirements. Management and systems science techniques such as linear programming, simulation, optimization, queuing theory, inventory models, PERT/CPM and expert systems are taught along with applications for solving realistic problems faced by agribusiness managers. Supporting courses provide a foundation of mathematics, chemistry, computer and communications skills. Technical electives are available to develop a degree program that meets personal career objectives. The curriculum is administered by the Department of Biological and Agricultural Engineering and leads to the Bachelor of Science degree in Agricultural Systems Management.
### Agricultural Systems Management Undergraduate Program

Curriculum (AY 2013-14 Catalog 136)

#### Freshman Year

<table>
<thead>
<tr>
<th>First Semester</th>
<th>(Th-Pr)</th>
<th>Cr</th>
<th>Second Semester</th>
<th>(Th-Pr)</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGLS 101 Modern Ag. Sys.</td>
<td>1-0</td>
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<td>AGSM 125 Intro. Ag. Syst. Mgmt.</td>
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<tr>
<td>AGSM 201 Power Energy Syst.</td>
<td>2-2</td>
<td>3</td>
<td>CHEM 10 Fund. of Chemistry</td>
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<tr>
<td>ENDG 105 Eng. Graphics</td>
<td>0-6</td>
<td>2</td>
<td>MATH 142 Business Math II</td>
<td>3-0</td>
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<td>ENGL 104 Comp. and Rhetoric</td>
<td>3-0</td>
<td>3</td>
<td>POLS 207 State and Local Govt.</td>
<td>3-0</td>
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<td>MATH 141 Business Math I</td>
<td>3-0</td>
<td>3</td>
<td><strong>ISYS 207</strong> or Computer elective&lt;sup&gt;3&lt;/sup&gt;</td>
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<tr>
<td>POLS 206 American Natl. Govt.</td>
<td>3-0</td>
<td>3</td>
<td>Humanities elective&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>KINE 198 Health and Fit. Activity</td>
<td>1-2</td>
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<td></td>
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</table>

#### Sophomore Year

<table>
<thead>
<tr>
<th>First Semester</th>
<th>(Th-Pr)</th>
<th>Cr</th>
<th>Second Semester</th>
<th>(Th-Pr)</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACCT 209</strong> Survey of Acct. Princ.&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3-0</td>
<td>3</td>
<td><strong>ACCT 210</strong> Surv. Cost Acct. Prim.</td>
<td>3-0</td>
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<tr>
<td>AGSM 301 Systems Analysis Ag.</td>
<td>3-0</td>
<td>3</td>
<td>AGEC 344 Food and Ag. Law</td>
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<tr>
<td>ECON 202 Prin. of Economics</td>
<td>3-0</td>
<td>3</td>
<td>or</td>
<td></td>
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<tr>
<td>ENGL 210 Technical Writing</td>
<td>3-0</td>
<td>3</td>
<td><strong>MGMT 209</strong> Bus., Govt., and Soc.&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td>PHYS 201 College Physics</td>
<td>3-3</td>
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<td>or</td>
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<td></td>
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<td>16</td>
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#### Junior Year

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<thead>
<tr>
<th>First Semester</th>
<th>(Th-Pr)</th>
<th>Cr</th>
<th>Second Semester</th>
<th>(Th-Pr)</th>
<th>Cr</th>
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</thead>
<tbody>
<tr>
<td><strong>AGEC 330</strong> Finc. Mgmt. In Ag.</td>
<td>3-0</td>
<td>3</td>
<td>AGSM 310 Ag. Machinery Mgmt</td>
<td>2-2</td>
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<tr>
<td>AGSM 335 Water and Soil Mgmt.</td>
<td>2-3</td>
<td>3</td>
<td>AGSM 315 Food Proc. Engr. Tech.</td>
<td>2-2</td>
<td>3</td>
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<tr>
<td><strong>MGMT 309</strong> Surv. of Mgmt.&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
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<td>AGSM 325 Agri-ind. Appl. Elect.</td>
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<tr>
<td>or</td>
<td></td>
<td></td>
<td>AGSM 360 Occup. Safety Mgmt.</td>
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<tr>
<td>AGEC 340 Agribus. Mgmt.</td>
<td>3-0</td>
<td>3</td>
<td>Technical elective&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
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<tr>
<td>STAT 303 Statistical Methods</td>
<td></td>
<td></td>
<td>or</td>
<td>3</td>
<td>15</td>
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<tr>
<td>or</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>STAT 302 Statistical Methods</td>
<td>3-0</td>
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<tr>
<td>American history elective&lt;sup&gt;1&lt;/sup&gt;</td>
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#### Senior Year

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<th>Cr</th>
<th>Second Semester</th>
<th>(Th-Pr)</th>
<th>Cr</th>
</tr>
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<tr>
<td><strong>AGEC 315</strong> Food and Ag. Sales</td>
<td></td>
<td></td>
<td>AGSM 440 Mgmt. Ag. Syst. II</td>
<td>1-5</td>
<td>3</td>
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<tr>
<td>or</td>
<td></td>
<td></td>
<td><strong>MKTG 309</strong> Intro. Marketing</td>
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<tr>
<td>Technical elective&lt;sup&gt;4&lt;/sup&gt;</td>
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<td></td>
<td>or</td>
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<tr>
<td>AGSM 337 Tech. Envr. Engr.</td>
<td>2-2</td>
<td>3</td>
<td>AGEC 314 Mark. Ag. Food Prod.</td>
<td>3-0</td>
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<tr>
<td>AGSM 403 Proc. Stor. Ag. Prod.</td>
<td>2-2</td>
<td>3</td>
<td>AGSM 410 Spat. Tech. Prec. Ag.</td>
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<tr>
<td>AGSM 439 Mgmt. Ag. Syst. I</td>
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<td>AGSM 481 Seminar</td>
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<td>or</td>
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<td>American history elective&lt;sup&gt;1&lt;/sup&gt;</td>
<td>3</td>
<td>17</td>
<td>AGSM 475 App. Info. Tech.</td>
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<tr>
<td>or</td>
<td></td>
<td></td>
<td>Technical elective&lt;sup&gt;5&lt;/sup&gt;</td>
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</table>

Note: Grade of C or better required for ACCT 209, AGSM 301, CHEM 101/111 ECON 202, MATH 141 and 142, and PHYS 201 or equivalents.

<sup>1</sup> To be selected from the University Core Curriculum, <sup>2</sup> A minor in business may be obtained by completing the noted courses and taking FINC 309 as a technical elective, <sup>3</sup> To be selected from a departmental approved list, <sup>4</sup> To be selected from a departmental approved list.
Course Descriptions

The following descriptions of courses required in the AGSM curriculum are quoted from the 2013-14 Undergraduate Catalog 136.

Accounting

ACCT 209 Survey of Accounting Principles. (3-0). Credit 3. I, II, S Accounting survey for non-business majors; non-technical accounting procedures, preparation and interpretation of financial statements and internal control. May not be used to satisfy degree requirements for majors in business. Business majors who choose to take this course must do so on a satisfactory/unsatisfactory basis.

ACCT 210 Survey of Managerial and Cost Accounting Principles. (3-0). Credit 3. II A survey of managerial and cost accounting for non-business majors; accounting responsibility of the manager, job and process cost systems, budgeting, cost-volume-profit analysis for decision-making. May not be used to satisfy degree requirements for majors in business. Business majors who choose to take this course must do so on a satisfactory/unsatisfactory basis. Prerequisite: ACCT 209.

Agricultural Economics

AGEC 314 Marketing Agricultural and Food Products. (3-0). Credit 3. I, II, S General introductory course covering operations involved in movement of agricultural commodities from farmer to consumer, essential marketing functions of buying, selling, transportation, storage, financing, standardization, pricing and risk bearing. Prerequisites: AGEC 105 or 3 hours of economics; and junior or senior classification.

AGEC 315 Food and Agricultural Sales. (3-0) Credit 3. I, II Principles of professional sales techniques used in food and agricultural firms; develop a professional sales presentation; study current agribusiness industry professional salespersons. Prerequisites: Junior or senior classification.

AGEC 330 Financial Management in Agriculture. (3-0) Credit 1. I, II Principles of financial management of farms, ranches, livestock operations and other agribusiness firms; financial statement analysis, investment analysis, firm growth, risk management, cost of capital, income taxes, business organization, estate planning, legal aspects of borrowing and sources and terms of agricultural loans. Prerequisites: AGEC 105 or 3 hours of economics; ACCT 209 or 229; and junior or senior classification.

AGEC 340 Agribusiness Management. (3-0) Credit 3. I, II, S Systematic analysis of agribusiness firm-level decision making using a broad array of management concepts, managing agribusiness firms and their unique problems and opportunities, and exposure to decision making in agribusiness environment. Prerequisites: AGEC 105 or 3 hours of economics; and junior or senior classification.

AGEC 344 Agricultural Law. (3-0). Credit 3. I, II Legal problems relevant to agribusiness; torts, fencing laws, liability for agricultural pollution, irrigation water rights, corporations and partnerships. Prerequisite: Junior or senior classification or approval of instructor.

Agricultural Systems Management

AGSM 125 Introduction to Agricultural Systems Management. (0-2). Credit 1. II Introduction to technical management of agricultural systems using management projects presented by agricultural managers from industry; problem definition, information search, idea generation and development of
management solutions. Prerequisite: Freshman or sophomore classification or approval of instructor; majors only.

AGSM 201 Power and Energy Systems. (2-2). Credit 3. I, II, S Tractors and other internal combustion power units used on farms; principles of operation, horsepower measurements, maintenance and adjustments of the electrical, ignition, fuel, lubricating and cooling systems.

AGSM 301 Systems Analysis in Agriculture. (3-0). Credit 3. I Operations research and systems theory applied to management problems in food and agricultural industries; linear programming, queuing theory, simulation and critical path method; provides students with the knowledge and computer skills to better manage resources for the evolving agricultural industries. Prerequisite: Junior or senior classification or approval of instructor.

AGSM 310 Agricultural Machinery Management. (2-2). Credit 3. II Selection of a matched complement of power units and machines for farming operations; consider constraints such as crops, season, weather, personnel and capital; apply systems techniques such as linear programming, optimization, queuing theory and inventory models; utilize available software programs and learn to develop electronic spreadsheets and other customized software. Prerequisites: AGSM 301; AGEC 330.

AGSM 315 Food Process Engineering Technology. (2-2). Credit 3. I, II Elementary mechanics, physical properties of food and processing materials, heat transfer, temperature measurement, solar heating and cooling, refrigeration and insulation, dehydration as applied to foods and food processing. Prerequisite: Junior or senior classification or approval of instructor. Cross-listed with FSTC 315.

AGSM 325 Agri-Industrial Applications of Electricity. (2-2). Credit 3. II Elements of electric current generation and transmission, applications of electric heating, lighting and power, wiring, motors, energy rates, meter reading, safety rules and regulations. Prerequisite: Agricultural systems management majors only or approval of instructor.

AGSM 335 Water and Soil Management. (2-3). Credit 3. I Elementary principles of surface and ground water supply, flood control, water distribution systems and irrigation systems; principles of drainage, soil conservation and erosion control; elementary surveying, chaining, leveling and mapping applied to agricultural and natural resource needs; illustrated by practical examples of terracing and farm pond design. Prerequisite: AGRO 301 or equivalent; AGSM 301.

AGSM 337 Technology for Environmental and Natural Resource Engineering. (3-0). Credit 3. I For the non-engineering student in the environmental and management sciences; concentrates on the application of technology for solving local environmental problems while considering global issues; reduction of water, air and hazardous waste pollutants; legislative issues and modeling. Prerequisites: AGRO 301 or approval of instructor; AGSM 301; MATH 142.

AGSM 355 Energy and Conversion Systems. (3-0). Credit 3. Basic physical conversion principles of energy use, including historical and future patterns; conservation measures, alternative energy sources, and the environment impact of U.S. and world energy use. Prerequisites: Junior or senior classification; nonmajors only.

AGSM 360 Occupational Safety Management. (3-0). Credit 3. I, II, S Safety considerations in the work environment, including safety mandates, safety mission, personal and business liability, fire, chemical, dust, machine noise, personal protective devices; design and implementation of safety programs. Prerequisite: Junior or senior classification or approval of instructor.
Agricultural Systems Management  
Undergraduate Program

AGSM 403 Processing and Storage of Agricultural Products. (2-2). Credit 3. I Factors influencing the nature of biological materials and the preservation of quality throughout the harvesting, handling and processing system; a systems approach to cereal grains includes principles of drying, quality deterioration, storage, conveying and handling; processing of fiber crops. Prerequisites: AGSM 310 and 315.

AGSM 410 Spatial Technology for Precision Agriculture. (2-2). Credit 3. Information techniques and technologies of precision agriculture and their application within agronomic systems with emphasis on commercial practices; including global positioning system, mapping software, variable rate technologies and decision support systems; selection of appropriate technologies for use in a management system. Prerequisites: AGRO 301, AGSM 301; AGLS 201 or equivalent; junior classification.

AGSM 435 Irrigation Principles and Management. (2-3). Credit 3. Principles of irrigation and management for efficient use of water; soil-water-plant relationships; methods of application; power and labor requirements; automated systems and components. Prerequisites: AGSM 335, AGSM 301, MATH 141.

AGSM 439 Management of Agricultural Systems I. (0-2). Credit 1. I Application of agricultural systems management principles in solving realistic problems faced by agribusiness managers; project selection from problems posed by biological and agricultural industry consultants; project feasibility study and outline; management and application philosophy; teamwork and communication; economics; product liability and reliability; standards and codes; goal setting and time management. Prerequisites: AGSM 301, senior classification; AGSM majors only

AGSM 440. Management of Agricultural Systems. (1-5). Credit 3. II Management of agricultural systems through team solution of management problems posed by agribusiness managers, farmers, extension specialists and other industry consultants; application of management principles to give students experience in solving realistic problems faced by agribusiness managers; critical evaluation of results by students, staff and consultants. Prerequisites: AGSM 439; should be taken last spring semester prior to graduation.

AGSM 461 Geographic Information Systems for Resource Management. (2-2). Credit 3. Geographic Information System (GIS) approach to the integration of spatial and attribute data to study the capture, analysis, manipulation and portrayal of natural resource data; examination of data types/formats; integration of GIS with remote sensing and Global Positioning System; lab use of GIS applications to conduct analyses of topics in natural resources. Prerequisite: Junior or senior classification or approval of instructor. Cross-listed with FRSC 461.

AGSM 462 Advanced GIS Analysis for Natural Resource Management. (2-2). Credit 3. Advanced topics in Geographic Information Systems (GIS) to solve natural resource problems; manipulation of raster data types; three-dimensional modeling; emphasis on geo-processing as it relates to applied projects particularly with habitat suitability models; field and lab use of global positioning systems (GPS); internet-based GIS modeling. Prerequisites: AGSM 461, FRSC 461, SPSC 461, GEOG 390 or LAND 461. Cross-listed with ESSM 462 and GEOG 462.

AGSM 470 Agricultural Electronics and Control. (2-2). Credit 3. I Technology of electronic systems in agricultural production and processing, sensors, actuators, and controllers, controller hardware and computer bases. Prerequisite: AGSM 325.

AGSM 475 Applied Information Technologies for Agricultural Systems. (2-2). Credit 3. Definition and documentation of the value of information in agriculturally-based technology companies; methods for mapping information flow within the company and across companies; articulation value of information within a value chain for a food product by simulation; and projects using project management software and web-based interactions. Prerequisites: INFO 209 or equivalent; junior or senior classification.
AGSM 481 Seminar. (1-0). Credit 1. I Professional development; ethics; career opportunities and topics of interest related to the practice of agricultural systems management. Prerequisite: Senior classification.

Agriculture and Life Sciences

AGLS 101 Modern Agricultural Systems and Renewable Natural Resources. (1-0). Credit 1. I, II An introduction to modern agriculture and the natural, human and scientific resources upon which it depends.

Chemistry

CHEM 101 Fundamentals of Chemistry I. (3-3). Credit 4. I, II, S Lecture: introduction to modern theories of atomic structure and chemical bonding; chemical reactions; stoichiometry; states of matter; solutions; equilibrium; acids and bases; coordination chemistry; laboratory: introduction to methods and techniques of chemical experimentation; qualitative and semiquantitative procedures applied to investigative situations.

CHEM 107 General Chemistry for Engineering Students. (3-3). Credit 4. I, II Introduction to important concepts and principles of chemistry; emphasis on areas considered most relevant in an engineering context; practical applications of chemical principles in engineering and technology. Students completing CHEM 107 and changing majors to curricula requiring CHEM 101 and CHEM 102 may substitute CHEM 107 for CHEM 101. Students may not receive credit for both CHEM 107 and CHEM 101.

Communication

COMM 203 Public Speaking. (3-0). Credit 3. I, II, S Training in speeches of social and technical interest designed to teach students to develop and illustrate ideas and information and to inform, stimulate, and persuade their audiences.

Economics

ECON 202 Principles of Economics. (3-0). Credit 3. Elementary principles of economics; the economic problem and the price system; theory of demand, theory of production and the firm, theory of supply; the interaction of demand and supply.

ECON 203 Principles of Economics. (3-0). Credit 3. Measurement and determination of national income, employment and price; introduction to monetary and fiscal policy analysis; the effects of government deficits and debt, exchange rates and trade balances. Prerequisite: ECON 202 or approval of undergraduate advisor.

Engineering Design Graphics

ENDG 105 Engineering Graphics. (0-6). Credit 2. I, II, S Graphical approach to the engineering design process as applied to products; methods of graphical communications, three-dimensional geometry, working drawings, data analysis, computer graphics; introduction to team dynamics and creative problem solving.

English

ENGL 104 Composition and Rhetoric. (3-0). Credit 3. Focus on referential and persuasive researched essays through the development of analytical reading ability, critical thinking and library research skills; for U1 and U2 students only. (ENGL 104I offered for students whose native language is not English.)
<table>
<thead>
<tr>
<th>Program</th>
<th>Course</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td><strong>Agricultural Systems Management</strong></td>
<td>ENGL 210 Scientific and Technical Writing. (3-0)</td>
<td>3</td>
<td>Principles of composition, rhetoric, and document design applied to the basic genres of research-based scientific and technical writing, including the report, proposal, manual, resume and professional correspondence. Appropriate for all majors. Computer sections available. Prerequisite: ENGL 104.</td>
</tr>
<tr>
<td><strong>Information and Operations Management</strong></td>
<td>INFO 209 Business Information Systems Concepts. (3-0)</td>
<td>3</td>
<td>Introduction to the use of computers in data and document management and as a problem-solving tool for business; fundamental concepts of information technology and theory; opportunities to use existing application software to solve various business information systems oriented problems. May not be used to satisfy degree requirements for majors in business. Prerequisite: For students other than business and agribusiness majors.</td>
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<tr>
<td><strong>Kinesiology</strong></td>
<td>KINE 198 Health and Fitness Activity. (0-2)</td>
<td>1</td>
<td>Half lecture; half activity; student choice of designated fitness or strength related activities; lecture portion covers current health topics.</td>
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<td></td>
<td>KINE 199 Required Physical Activity. (0-2)</td>
<td>1</td>
<td>Selection from a wide variety of activities designed to increase fitness and/or encourage the pursuit of lifetime activity.</td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td>MGMT 209 Business, Government and Society. (3-0)</td>
<td>3</td>
<td>Impact of the external environment—legal, political, economic and international—on business behavior; market and non-market solutions to contemporary public policies confronting business persons examined including antitrust law, employment and discrimination law, product safety regulation, consumer protection and ethics. Prerequisites: Sophomore classification; for students other than business and agribusiness majors.</td>
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<tr>
<td></td>
<td>MGMT 212 Business Law. (3-0)</td>
<td>3</td>
<td>Legal principles of business; legal reasoning; dispute resolution and procedure; contract law; bankruptcy law; property law; Uniform Commercial Codes sections concerning contracts, security interests, negotiable instruments and sales. Prerequisites: Sophomore classification.</td>
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<td></td>
<td>MGMT 309 Survey of Management. (3-0)</td>
<td>3</td>
<td>Survey of the basic functions and responsibilities of managers; includes the environmental context of management, planning and decision making, organization structure and design, leading and managing people, and the controlling process; issues of globalization, ethics, quality and diversity integrated throughout the course. Prerequisites: Junior classification; for students other than business and agribusiness majors.</td>
</tr>
<tr>
<td><strong>Marketing</strong></td>
<td>MKTG 309 Introduction to Marketing. (3-0)</td>
<td>3</td>
<td>A survey course of the basic principles of marketing and key decision areas; product, promotion, distribution and pricing. May not be used to satisfy degree requirements for majors in business. Prerequisites: Junior classification; for students other than business and agribusiness majors.</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>MATH 141 Business Mathematics I. (3-0)</td>
<td>3</td>
<td>Linear equations and applications, systems of linear equations, matrix algebra and applications, linear programming (graphical and simplex methods), probability and applications, statistics. Prerequisites: High school algebra I and II and geometry. Credit will not be given for more than one of MATH 141 and 166.</td>
</tr>
</tbody>
</table>
Math 142 Business Mathematics II. (3-0). Credit 3. I, II, S Derivatives, curve sketching and optimization, techniques of derivatives, logarithms and exponential functions with applications, integrals, techniques and applications of integrals, multivariate calculus. Prerequisites: High school algebra I and II and geometry or satisfactory performance on a qualifying examination. Credit will not be given for more than one of MATH 131, 142, 151 and 171.

Physics


Political Science


Statistics

STAT 302 Statistical Methods. (3-0). Credit 3. I, II, S Intended for undergraduate students in the biological sciences and agriculture (except agricultural economics). Introduction to concepts of random sampling and statistical inference; estimation and testing hypotheses of means and variances; analysis of variance; regression analysis; chi-square tests. Credit will not be allowed for more than one of STAT 301, 302 or 303. Prerequisite: MATH 141 or 166 or equivalent.

STAT 303 Statistical Methods. (3-0). Credit 3. I, II, S Intended for undergraduate students in the social sciences. Introduction to concepts of random sampling and statistical inference, estimation and testing hypotheses of means and variances, analysis of variance, regression analysis, chi square tests. Credit will not be allowed for more than one of STAT 301, 302 or 303. Prerequisite: MATH 141 or 166 or equivalent.

Suggested Technical Electives

The AGSM curriculum includes 9 or 12 hours of technical electives depending on whether or not a student opts to take a technical elective rather than AGEC 315 Food and Agricultural Sales. Technical electives must be 300- or 400-level courses in Agriculture, Engineering Technology, or Geosciences. Upper level Business are allowed as technical electives, but these courses are often not available to non-business majors. Exceptions to these guidelines include:

- Certain 300- and 400-level courses in the College of Agriculture and Life Sciences are disallowed due to minimal technical content.
- Because Construction Science does not allow non-majors to take upper level courses, nine hours of 200 level courses are counted as six hours of technical electives.
- One 200 level course can be accepted as a technical elective if it is taken as a prerequisite for two additional 3-400 level courses in the same department, and if the course is accepted by the AGSM coordinator in advance of enrollment.
University Graduation Requirements

Texas A&M University has a Core Curriculum that is required of all students. The following description of core curriculum requirements is quoted from the 2013-14 Undergraduate Catalog 136.

University Core Curriculum

Specific Requirements
In addition to the University Core Curriculum and degree specific requirements, Texas A&M has criteria that must be met by all students in order to receive a degree, see Requirements for a Baccalaureate Degree.

1. The ability to communicate through the use of the spoken or written word requires the development of speech and writing skills.

Communication (6 hours)
A course used to satisfy this requirement shall have as its primary focus the improvement of student expression in communication. This focus on student expression should be demonstrated both in course instruction and assessment. Acceptable forms of student expression may range from creative to technical. Acceptable courses may include those embedded in subject areas other than writing. This requirement must be satisfied by ENGL 104 (3 hours) and one of the following:
AGJR 404       ENGL 210
COMM 203       ENGL 235
COMM 205       ENGL 236
COMM 243       ENGL 241
ENGL 203       ENGL 301

2. Without knowledge of mathematics, the language of science; and logic, the art of critical inquiry; it is not possible to understand or participate in the development of knowledge.

Mathematics (6 hours, at least 3 of which must be in mathematics)
To be selected from any mathematics course except:
MATH 102
MATH 103
MATH 150
MATH 365
MATH 366

Also may select 3 hours from:
PHIL 240
PHIL 341
PHIL 342

3. Knowledge and appreciation of science as a significant human activity, rather than merely a listing of results or collection of data, is acquired only by engaging in the activities of science.

Natural Sciences (8 hours)
Two or more natural sciences courses which deal with fundamental principles and in which critical evaluation and analysis of data and processes are required. A minimum of one course shall include a corresponding laboratory. Non-technical courses are specifically excluded.
Four hours to be selected from:
BIOL 111    CHEM 107
BIOL 113/123 GEOL 101
BOTN 101    PHYS 201
CHEM 101    PHYS 218
CHEM 103/113 ZOOL 107

Remaining hours to be selected from courses listed and/or:
AGRO 105    CHEM 222/242    HORT 201/202
AGRO 301    ENGR 101       OCNG 251/252
AGRO 405    ENTO 322       PHYS 202
ANTH 225    FRSC 304       PHYS 208
ATMO 201/202 GENE 301       PHYS 219
BESC 201    GENE 310       PHYS 306/307
BIOL 112    GEOG 203/213   RENR 205/215
CHEM 102    GEOL 106       ZOOL 225
CHEM 104/114 GEOL 307
CHEM 106/116 GEOS 410

4. Knowledge of our culture and its ideals makes possible both social integration and self-realization (see note 4).

**Humanities (3 hours)**
Courses used to satisfy this requirement shall address one of the following subject areas: history, philosophy, literature, the arts, culture or language (exclusive of courses devoted predominantly to acquiring language skills in a student’s native language). Acceptable courses are:

<table>
<thead>
<tr>
<th>AMST 300</th>
<th>COMM 425</th>
<th>ENGL 330</th>
<th>ENGL 393</th>
<th>MUSC 200</th>
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<tbody>
<tr>
<td>AMST 320</td>
<td>ENDS 149</td>
<td>ENGL 333</td>
<td>ENGL 394</td>
<td>MUSC 201</td>
</tr>
<tr>
<td>ANTH 202</td>
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<td>ENGL 396</td>
<td>MUSC 311</td>
</tr>
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<td>ENGL 335</td>
<td>ENGL 401</td>
<td>MUSC 312</td>
</tr>
<tr>
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<td>ENDS 329</td>
<td>ENGL 336</td>
<td>ENGL 412</td>
<td>MUSC 315</td>
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<tr>
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<td>ENGL 203</td>
<td>ENGL 337</td>
<td>ENGL 414</td>
<td>MUSC 319</td>
</tr>
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<td>ENGL 338</td>
<td>ENGL 415</td>
<td>MUSC 321</td>
</tr>
<tr>
<td>ANTH 306</td>
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<td>ENGL 339</td>
<td>ENGL 431</td>
<td>MUSC 324</td>
</tr>
<tr>
<td>ANTH 308</td>
<td>ENGL 212</td>
<td>ENGL 340</td>
<td>ENGL 474</td>
<td>PHIL (any cour</td>
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<tr>
<td>ANTH 313</td>
<td>ENGL 221</td>
<td>ENGL 345</td>
<td>ENGL 481</td>
<td>except 240,</td>
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<tr>
<td>ANTH 315</td>
<td>ENGL 222</td>
<td>ENGL 346</td>
<td>ENGR 482</td>
<td>341, 342)</td>
</tr>
<tr>
<td>ANTH 316</td>
<td>ENGL 227</td>
<td>ENGL 347</td>
<td>GEOG 202</td>
<td>RELS 211</td>
</tr>
<tr>
<td>ANTH 317</td>
<td>ENGL 228</td>
<td>ENGL 348</td>
<td>GEOG 301</td>
<td>RELS 213</td>
</tr>
<tr>
<td>ANTH 318</td>
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<td>GEOG 305</td>
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<tr>
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</tr>
<tr>
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<td>ENGL 235</td>
<td>ENGL 352</td>
<td>HIST (any</td>
<td>RELS 317</td>
</tr>
<tr>
<td>ANTH 351</td>
<td>ENGL 236</td>
<td>ENGL 353</td>
<td>course)</td>
<td>RELS 351</td>
</tr>
<tr>
<td>ARCH 345</td>
<td>ENGL 251</td>
<td>ENGL 354</td>
<td>HORT 203</td>
<td>RELS 360</td>
</tr>
<tr>
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<td>ENGL 308</td>
<td>ENGL 355</td>
<td>HUMA 211</td>
<td>THAR 101</td>
</tr>
<tr>
<td>ARCH 434</td>
<td>ENGL 310</td>
<td>ENGL 356</td>
<td>HUMA 213</td>
<td>THAR 155</td>
</tr>
<tr>
<td>ARTS 149</td>
<td>ENGL 312</td>
<td>ENGL 360</td>
<td>HUMA 303</td>
<td>THAR 201</td>
</tr>
</tbody>
</table>
## Visual and Performing Arts (3 hours)

Acceptable courses are:

| ARTS 150 | ENGL 313 | ENGL 361 | HUMA 304 | THAR 280 |
| ARTS 329 | ENGL 314 | ENGL 362 | LAND 240 | THAR 281 |
| ARTS 330 | ENGL 315 | ENGL 365 | LAND 340 | WMST 200 |
| ARTS 335 | ENGL 316 | ENGL 374 | LBAR 203 | WMST 333 |
| ARTS 349 | ENGL 317 | ENGL 375 | LBAR 331 | WMST 374 |
| ARTS 350 | ENGL 319 | ENGL 376 | LBAR 332 | WMST 461 |
| ARTS 445 | ENGL 321 | ENGL 377 | LBAR 333 | WMST 473 |
| CLAS 351 | ENGL 322 | ENGL 378 | LING 307 | WMST 474 |
| COMM 301 | ENGL 323 | ENGL 385 | LING 310 | WMST 477 |
| COMM 327 | ENGL 329 | ENGL 390 | MODL* |

* or any course in the Department of Hispanic Studies or the Department of European and Classical Languages and Cultures (see note 5).

5. As the human social environment becomes more complex, it is increasingly important for individuals to understand the nature and function of their social, political and economic institutions (see note 4).

## Social and Behavioral Sciences (3 hours)

Courses used to satisfy this requirement shall address one of the following subject areas: anthropology, economics, political science, geography, psychology, sociology or communication. Acceptable courses are:

| ADEV 340 | ANTH 403 | GEOG 201 | JOUR 440 | SOCI (any course except any course) |
| ADEV 400 | ANTH 404 | GEOG 304 | KINE 304 | 220, 420 |
| ADEV 440 | ANTH 410 | GEOG 306 | KINE 319 | 220, 420 |
| AGEC 105 | COMM 315 | GEOG 311 | LBAR 204 | VTPB 221 |
| AGEC 350 | COMM 320 | GEOG 330 | LING 209 | WMST 207 |
| AGEC 429 | COMM 325 | GEOG 401 | LING 311 | WMST 300 |
| AGEC 430 | COMM 335 | GEOG 440 | LING 402 | WMST 316 |
| AGEC 452 | ECON (any course) | HLTH 236 | MGMT 475 | WMST 317 |
| AGEC 453 | HORT 335 | POLS (any course) | WMST 404 |
### U.S. History and Political Science (12 hours, 6 hours of history and 6 hours of political science)

To be a responsible citizen of the world it is necessary, first, to be a responsible citizen of one’s own country and community.

POLS 206 and 207 and HIST 105 and 106 or other courses in American and Texas history, except those courses pertaining solely to Texas history may not comprise more than 3 hours.

6. As individual and national destinies become progressively more interconnected, the ability to survive and succeed is increasingly linked to the development of a more pluralistic, diverse and globally-aware populace. Two courses from the following list are to be taken by the student. If a course listed below also satisfies another University Core Curriculum requirement, it can be used to satisfy both requirements if the student wishes to do so. For example, a course that satisfies the Social and Behavioral Sciences requirement may be used to satisfy the International and Cultural Diversity requirement if that course also appears on the list.

### International and Cultural Diversity (6 hours)

Acceptable courses are:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Department</th>
<th>Course Code</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 445</td>
<td>ENGL 251</td>
<td>HIST 346</td>
<td>LING 307</td>
<td>RUSS 401</td>
</tr>
<tr>
<td>ADEV 422</td>
<td>ENGL 333</td>
<td>HIST 348</td>
<td>LING 402</td>
<td>SOCI 207</td>
</tr>
<tr>
<td>AGEC 452</td>
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<td>HIST 352</td>
<td>MGMT 430</td>
<td>SOCI 316</td>
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<tr>
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<td>HIST 355</td>
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<td>HIST 356</td>
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<tr>
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<td>HIST 402</td>
<td>MKTG 330</td>
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</tr>
<tr>
<td>ANTH 300</td>
<td>ENGL 340</td>
<td>HIST 405</td>
<td>MKTG 401</td>
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</tr>
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<tr>
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<tr>
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</tr>
<tr>
<td>ANTH 324</td>
<td>ENGL 474</td>
<td>HIST 449</td>
<td>MODL 352</td>
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</tr>
<tr>
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<td>FINC 445</td>
<td>HIST 451</td>
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<td>SOCI 419</td>
</tr>
<tr>
<td>ANTH 404</td>
<td>FREN 301</td>
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<tr>
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<td>HIST 461</td>
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<tr>
<td>ARTS 150</td>
<td>FREN 414</td>
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<td>MUSC 319</td>
<td>SPAN 320</td>
</tr>
<tr>
<td>ARTS 350*</td>
<td>FREN 418</td>
<td>HIST 473</td>
<td>MUSC 324</td>
<td>SPAN 410</td>
</tr>
<tr>
<td>CARC 301</td>
<td>GEOG 202</td>
<td>HIST 477</td>
<td>PHIL 283</td>
<td>SPAN 411</td>
</tr>
<tr>
<td>CARC 311</td>
<td>GEOG 301</td>
<td>HLTH 236</td>
<td>PHIL 416</td>
<td>SPAN 412</td>
</tr>
<tr>
<td>CARC 321</td>
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<td>HLTH 334</td>
<td>PHIL 419</td>
<td>SPAN 421</td>
</tr>
<tr>
<td>CARC 331</td>
<td>GEOG 306</td>
<td>HORT 335</td>
<td>PLAN 415</td>
<td>SPAN 450</td>
</tr>
<tr>
<td>CARC 335</td>
<td>GEOG 311</td>
<td>HUMA 303</td>
<td>POLS 317</td>
<td>TEFB 271</td>
</tr>
<tr>
<td>COMM 327</td>
<td>GEOG 320</td>
<td>HUMA 304</td>
<td>POLS 322</td>
<td>TEFB 273</td>
</tr>
<tr>
<td>COMM 335</td>
<td>GEOG 321</td>
<td>IBUS 401</td>
<td>POLS 323</td>
<td>THAR 201</td>
</tr>
<tr>
<td>COMM 425</td>
<td>GEOG 323</td>
<td>IBUS 445</td>
<td>POLS 324</td>
<td>THAR 281</td>
</tr>
<tr>
<td>COSC 484*</td>
<td>GEOG 402</td>
<td>IBUS 446</td>
<td>POLS 326</td>
<td>VTPB 221</td>
</tr>
</tbody>
</table>
7. As the ancient scholars knew and as modern research has confirmed, the development of the body as well as the mind is an integral part of the educational process.

Kinesiology requirements are to be fulfilled by completing KINE 198 Health and Fitness and any other one KINE 199 course. KINE 199 used to fulfill University Core Curriculum requirements must be taken S/U. KINE 199 courses not included in the University Core Curriculum can be taken for a grade in accordance with the student’s college policy. Transfer students with fewer than 2 hours of kinesiology credit must meet the KINE 198 requirement either by transfer of credit or by taking the course at Texas A&M.

Notes:
1. Individual degree programs may impose more restrictive requirements in any of these areas. Students should consult the degree listing in this catalog and their academic advisors to ensure that they are satisfying all requirements of their majors.
2. With the exception of courses satisfying the International and Cultural Diversity requirement (see section 6), no course shall be counted twice by the same student toward satisfaction of the University Core Curriculum requirements. For example, if a student elects to use ARCH 349 to satisfy the Visual and Performing Arts requirement, the student may not use the course to satisfy the Humanities requirement.
3. Courses numbered 285 or 485 do not satisfy University Core Curriculum requirements. Individual Special Topics (289 and 489) courses may be approved for use in the Core Curriculum.
4. No student may satisfy all 12 hours of University Core Curriculum requirements in the categories of humanities, visual and performing arts, and social and behavioral Sciences by courses having the same prefix.
5. If courses in MODL are used to fulfill the Humanities requirement, they must be in a different language than taken in high school or, if in the same language, at the 200-level or higher. For example, if the student took Spanish in high school, then the student may not use SPAN 101 or 102 in satisfying the Humanities requirement.
6. Students transferring course credit to satisfy the University Core Curriculum requirements should refer to the Texas Common Course Numbering System (see Appendix B) and the Transfer Course Credit Policies in this catalog.
7. Only sections of these courses taken abroad will satisfy the international and cultural diversity requirement.
Agricultural Systems Management

In addition to the Core Curriculum, graduation requirements include three hours of Computer Science and the equivalent of two semesters of college-level foreign language. AGSM students meet the Computer Science requirement with required courses. Most students meet the foreign language requirement by taking two years of the same foreign language in high school. Those who must take college level foreign language do so in addition to the AGSM degree requirements.

Degrees Conferred

Bachelor of Science in Agricultural Systems Management
Master of Agriculture in Agricultural Systems Management
Master of Science in Agricultural Systems Management

Teaching Staff

University Administrative Organization Chart
Departmental Teaching Faculty

Biological and Agricultural Engineering faculty holding teaching appointments are listed in Table 6. For those faculty teaching in the AGSM program, the percentage of their teaching effort and their assigned AGSM courses are shown.

Table 6. Faculty involved in AGSM curriculum instruction

<table>
<thead>
<tr>
<th>Name</th>
<th>% of Teaching Time in AGSM</th>
<th>Courses Taught 2014 Calendar Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sergio Capareda</td>
<td>33</td>
<td>AGSM 310</td>
</tr>
<tr>
<td>Elena Castell-Perez</td>
<td>33</td>
<td>AGSM 315</td>
</tr>
<tr>
<td>Brock Faulkner</td>
<td>100</td>
<td>AGSM 403, 360</td>
</tr>
<tr>
<td>Cady Engler</td>
<td>25</td>
<td>AGSM 475</td>
</tr>
<tr>
<td>Jim Gilley</td>
<td>50</td>
<td>AGSM 125, 435</td>
</tr>
<tr>
<td>Carmen Gomes</td>
<td>25</td>
<td>AGSM 315</td>
</tr>
<tr>
<td>Yongheng Huang</td>
<td>0</td>
<td>AGSM 335</td>
</tr>
<tr>
<td>Ron Lacey</td>
<td>25</td>
<td>AGSM 489</td>
</tr>
<tr>
<td>Russell McGee</td>
<td>100</td>
<td>AGSM 301, 439, 440</td>
</tr>
<tr>
<td>Clyde Munster</td>
<td>50</td>
<td>AGSM 335*, 337*</td>
</tr>
<tr>
<td>Calvin Parnell</td>
<td>50</td>
<td>AGSM 301</td>
</tr>
<tr>
<td>Gary Riskowski</td>
<td>50</td>
<td>AGSM 439, 440</td>
</tr>
<tr>
<td>Greg Stark</td>
<td>100</td>
<td>AGSM 201, 325, 470</td>
</tr>
</tbody>
</table>

*Course offered as part of study abroad program.
Administrative and Resource Support

Teaching Allotments

For Fall 2014, the department had 10.41 FTEs of teaching tenured/tenure track faculty, one non-tenure faculty, and one half FTE as a lecturer. Twenty-one individuals held teaching/research appointments and two were full time teaching in the Agricultural Systems Management program. The department also teaches courses in Biological and Agricultural Engineering. The distribution of teaching assignments between the undergraduate majors varies over time, and portion of faculty participating in AGSM courses changes. All faculty with teaching appointments are involved in advising Agricultural Systems Management students.

Teaching AGSM courses represents a heavy time commitment for assigned faculty. The required courses typically have 60-70 students in two or three lab sections. Most courses are taught once per year, while high demand courses (AGSM 201 and 301) are taught both fall and spring. With the combination of AGSM, engineering and graduate courses, faculty teaching loads easily exceed the number of contact hours required by university formula for their percentage teaching appointment.

Financial Resources

The FY 2015 (Sept. 2014-Aug. 2015) academic budget (including faculty, teaching assistant and staff salaries) for the Department of Biological and Agricultural Engineering is approximately $2,144,660. The funds support our undergraduate programs in Biological Systems Engineering, Agricultural Engineering and Agricultural Systems Management, and our graduate programs. Texas A&M University charges an instructional enhancement/equipment access fee of all students in laboratory courses. These funds come to the department in proportion to the number of student credit hours taught in our laboratories. These funds are spent entirely on instruction, with a strong effort to use the majority of the funds on laboratory equipment. A portion of the funds are committed to salaries of staff that assist in academic instruction. Table 7 shows the total fees received and the portions of those funds allocated to faculty to support their courses.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Total Fees</th>
<th>Faculty Allocations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-12</td>
<td>$115,406</td>
<td>$89,041</td>
</tr>
<tr>
<td>2012-13</td>
<td>$118,223</td>
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</tr>
<tr>
<td>2013-14</td>
<td>$101,529</td>
<td>$64,480</td>
</tr>
</tbody>
</table>

Due to the number of AGSM majors and the demand for AGSM courses by other majors, a disproportionate amount of the teaching budget goes to AGSM courses. For example, many graduate teaching assistantships are assigned to assist faculty teaching AGSM courses due to the multiple sections and heavy reliance on laboratories. In addition, undergraduate teaching
assistants are hired for many AGSM courses. It is difficult to attribute expenditures to a specific major, as most resources are used in both the AGSM and engineering curricula. An estimate of the portion of departmental annual expenditures for the undergraduate Agricultural Systems Management program is 35 percent.

Physical Facilities

Classroom facilities are located in Scoates Hall and the Power and Machinery Building. Scoates Hall contains four classrooms ranging in size from 30 to 120 seats. The Power and Machinery Building has two classrooms of 40 and 70 seats. Scheduling of all these classrooms is under the control of the registrar, though the department has priority if the classroom is fully utilized. Many of the AGSM classes are too large for the smaller rooms but do not fill the largest lecture hall. As a result, several classes are scheduled in other buildings on campus. Demand for classrooms is high throughout the campus and causes challenges in course scheduling.

Laboratories are also located in Scoates and the Power and Machinery Building. Laboratories in the Power and Machinery Building are primarily dedicated to teaching, while labs in Scoates are primarily research labs that are also sometimes used for instruction. The Price Hobgood Building is a research laboratory facility that is also occasionally used for laboratory instruction. Laboratory space and associated equipment used for the individual courses are described below.

The department now has three computer labs for student use. A computer laboratory with 23 workstations is available for laboratory instruction and free access by students in 214 Scoates Hall. A smaller lab for grad students only has 6 workstations in 213 Scoates. In 2012, we opened another computer lab for students with 12 workstations in 124 Hobgood. The workstations vary in processor capability, but are uniform in the operating system and available software. Each workstation has the Windows 7 operating system and Office 2013 software along with software specific to individual courses. Workstation replacement is on a three year schedule. The lab is networked to a departmental server that provides all AGSM majors and students enrolled in AGSM courses disk storage and printer access. Courses are scheduled in the undergraduate computing lab as necessary. Students have 24 hour access to the lab via a key-card entry system when the lab is not scheduled for a class.

Laboratory Facilities and Equipment

Following is a description of each course with a laboratory and the facilities and equipment used in the instruction of that course.

AGSM 125 Introduction to Agricultural Systems Management—This laboratory course emphasizes team problem solving. It is scheduled in a classroom and requires out-side class use of the computing facility. No unique equipment is used in this course.

AGSM 201 Power and Energy Systems—Labs are taught in a 4440 ft² area in the Power and Machinery Building. Twelve work stations equipped with complete sets of mechanics’ tools are
Agricultural Systems Management supported by specialized tools and instruments maintained in the tool room. Three tractor dynamometers, twelve tractor engines, including five diesel and seven spark ignition engines, are used in addition to carburetors, injection system components and electrical components. In 2013, we added four hydraulics trainers to the lab assets as well.

AGSM 310 Agricultural Machinery Management—This laboratory is taught in a classroom. The lab period is used as a recitation period for problem solving and for occasional field trips. The class has heavy utilization of the computing facility. No unique equipment is used for this class.

AGSM 315 Food Process Engineering Technology—This laboratory is taught in the Food Engineering Laboratory (896 ft²) in Scoates Hall. Equipment used in the course includes computer controlled analytical machines, viscometers, rheometers, incubator, sterilizer and colorimeter.

AGSM 325 Agri-Industrial Applications of Electricity—This laboratory is taught in a laboratory in Scoates Hall (884 ft²) dedicated to electricity, electronics and controls. Available equipment includes wiring boards, voltmeters, control components, motors, motor starters and oscilloscope meters.

AGSM 335 Water and Soil Management—This laboratory meets in a 70 seat classroom in the Power and Machinery Building. Most exercises are conducted outside the building at various locations on university property. Equipment for this class includes transits, surveying equipment, and GPS receivers.

AGSM 403 Processing and Storage of Agricultural Products—This laboratory meets in a 70 seat classroom in the Power and Machinery Building, while exercises are conducted in other locations. Instruments for measuring temperature, humidity, electrical power, etc., are used in this course. Fans, blowers, conveying systems designed and set up for laboratory studies are used extensively. The research cotton gin is also used for some exercises.

AGSM 410 Spatial Technologies for Precision Agriculture—This laboratory is scheduled in the computing lab. Approximately half of the labs are conducted using precision farming software on the workstations. The other labs meet outside in various locations on university property. Equipment used includes GPS receivers, a GPS machine guidance system, a variable rate sprayer and planter. Field trips are taken to the TAMU farm to examine field characteristics and machine performance.

AGSM 435 Irrigation Principles and Management—This laboratory meets in a classroom in Scoates Hall. The laboratory is used for problem solving and field trips to examine irrigation equipment in producers’ fields. The computing facility is used in problem solving.

AGSM 439 and 440 Management of Agricultural Systems—This course sequence is the senior level capstone experience, and is primarily independent study. It meets in a classroom (generally outside the department). No unique equipment is used in this course. There is a
AGSM 470 Agricultural Electronics and Controls—This laboratory is taught in a laboratory in Scoates Hall (884 ft²) dedicated to electricity, electronics and controls. Available equipment includes programmable logic controllers, voltmeters, control components, motors, motor starters and oscilloscope meters.

AGSM 475 Applied Information Technologies for Agricultural Systems—The laboratory is scheduled in the computing facility. All course exercises are computer based and rely on the software loaded on the workstations.

Teaching Aids

All classrooms typically used for AGSM courses are equipped with a computer, video projector, overhead projector, and screen. Two additional video projectors are available in the department for checkout. In other classrooms, projectors and laptop computers can be scheduled by faculty from the university sponsored medical center. All faculty have access to laptops computers for use in teaching. Teaching aids such as cutaways and working models are used in courses including engines, tractors, machinery, electricity, and electronic controls. Field trips are also incorporated into laboratories to supplement and expand upon visual and teaching aids used in the courses.

Library Facilities

The following descriptions of the Sterling C. Evans and Medical Sciences library facilities is quoted from the 2013-14 Undergraduate Catalog 136.

Sterling C. Evans Library

The University Libraries complex consists of the Sterling C. Evans Library and Annex, the Cushing Memorial Library and Archives, the West Campus Library, the Policy Sciences and Economics Library, and the Medical Sciences Library. The University’s principal research collections, numbering more than 3.3 million volumes and 5.4 million microforms, are housed in the centrally located Sterling C. Evans Library and Annex with seating for more than 4,000 readers. Currently more than 50 group study areas are available for students, faculty and staff.

The Advanced Studies Division staff provide assistance in using the reference collections as well as the general collection and specialized collections such as government documents and microform materials. Over 550 national and international electronic citation databases are available to students in the library and remotely. Scores of these files comprise citations to research literature, and a growing number of databases of full-text information from journals and other information sources are also available.
Reference services provide a broad program of library instruction, ranging from orientation tours to class sessions on subject-specific resources and research techniques.

The Cushing Memorial Library and Archives, repository for rare books, manuscripts, special collections and archives, is located on the west side of Evans Library, across from the Academic Building. The Educational Media Services (EdMS) on the fourth floor of the Annex provides audiovisual and multimedia services and videotape resources. It offers database and Internet searching for reference purposes. Multimedia authoring and development software such as Authorware, Director and Photoshop is also available.

Through the online catalog, LibCat, users can access the Library’s books and thousands of journal articles by author, title, subject and keyword searching. The bulk of the collections are organized according to the Library of Congress classification system. An “open stack” arrangement allows free access to all materials except those in Special Collections and Archives.

Approximately 45,710 serial titles are currently received, including some 150 state, national and foreign newspapers. The library is a depository for selected U.S. Federal documents. The library is also a depository for Texas State documents and U.S. patents. An extensive collection of technical reports is also housed in the library.

The West Campus Library primarily serves the Mays Business School. It has a limited, specialized collection of 650 periodicals, reference works and current monographs in business. The Library has reading space for 1,000. A document delivery service delivers materials between the Evans Library, the West Campus Library, and the Medical Sciences Library. The focus of the West Campus Library is the R. C. Barclay Reference and Retailing Resources Center. The Barclay Center offers a variety of electronic resources, including compact disk and online databases as well as access to the Internet, to serve the needs of business. Staff offer instruction on searching databases and consultation for specific information needs.

The Policy Sciences and Economics Library in the Annenberg Presidential Conference Center has a limited, specialized collection of periodicals, reference works and current monographs in political science, government and public service and economics. It also offers several hundred electronic journals and databases.

**Medical Sciences Library**

The Medical Sciences Library serves the College of Veterinary Medicine and Biomedical Sciences, Texas A&M University Health Science Center, and, the College of Agriculture and Life Sciences. The library houses a specialized collection of biomedical books, journals, and electronic resources as well as related materials in the areas of agriculture and the life sciences, such as biochemistry, animal science, nutrition, and the plant sciences. The Medical Sciences Library’s collection includes over 100,000 volumes of journals and books in print and other media, including electronic formats. Participation in a regional consortium of medical libraries expands access to several hundred more science, medicine and electronic journals. As one of the Texas A&M University Libraries, the Medical Sciences Library offers access to more than 17,000 electronic journals and almost 600 databases from its website.

Through outreach programs, MSL also offers access to biomedical information to local health institutions, as well as health care professionals in the community and immediate region. In addition, as the only veterinary library in Texas, MSL serves veterinarians state-wide. The staff also works with remote
extension service sites to meet information needs for agricultural users throughout Texas.

While the professional staff provides reference services to local and remote customers, the staff also provides instruction in database searching and managing biomedical and agricultural information. In addition, librarians attend rounds in veterinary clinics, providing information for patient care decisions. The MSL administers the only Clinical Veterinary Librarian program in the nation.

Open extensive hours to serve the students, staff and faculty of the TAMU System, the Medical Sciences Library offers remote access to its catalog and other electronic resources through its website at library.tamu.edu.

**Student and Student Agricultural Systems Management Club Recognition**

**Student Club**

The student Agricultural Systems Management Club has been recognized by the university since it was organized. The club is partly supported financially by the University Student Activities Fund, and by member dues. Partial support for student club members to attend national and regional meetings is provided from this fund.

**Sigma Mu**

During Fall 1983, the Texas A&M Chapter of Alpha Mu was organized and recognized by the University. The chapter is currently inactive.

**Additional Organizations**

Following are some of the organizations in which AGSM students are involved:

- Aggie Cinema
- Aggie Pullers
- Agricultural Council
- Alpha Zeta
- Corps of Cadets
- Dormitory Council
- Gamma Sigma Delta
- Intramural Officials Association
- National Rifle Association
- Saddle and Sirloin Club
- Texas Aggie Band
HIGH IMPACT LEARNING EXPERIENCES REPORT

Biological and Agricultural Engineering Department
College of Agriculture and Life Sciences
The Dwight Look College of Engineering
Texas A&M University
College Station, TX

February 19, 2015

Prepared for the:

Department of Biological and Agricultural Engineering Program Review
A&M BELGIUM ENVIRONMENTAL SCIENCE AND ENGINEERING PROGRAM

The Belgium program has been organized and produced each summer since its first initial trip in the summer of 2005.

The “low” countries of Belgium and the Netherlands are among the leaders in the world in hydrology and in the recycling of wastes and development of alternative waste treatment methods. In this 5-week program, students will learn about the hydrologic cycle and water and waste treatment technologies and will compare U.S. and European practices and environmental policies. The Belgium Environmental Science and Engineering program is held at Katholieke Universiteit Leuven which is located approximately 30 km east of Brussels in the city of Leuven.

K.U. Leuven was established in 1425 and it is now a modern, world-class university with excellent facilities. Leuven is a compact, student-oriented city. All students are provided a bicycle for transportation to class and around town.

Field trips and seminar speakers allow students to learn about European environmental practices and policies and compare them to U.S. practices. Field trip sites include the innovative system of sea gates installed by the Netherlands to protect coastal areas from flooding; plants for municipal wastewater treatment, household organic waste composting, and treatment of drinking water; facilities for collection of groundwater; and a system of sinkholes and caves to see the interaction between surface and groundwater. Additional field trip sites include various methods of processing animal manure to produce value-added products and meet EU requirements for reducing environmental impact. In addition to course activities, students will have three- and four-day weekends to explore Europe on their own. Popular sites include Paris, Amsterdam, München (Munich), Köln (Cologne), London, Berlin and Brussels.

DATA AND METRICS

Currently for the summer 2015 semester, there are 14 BAEN students and 3 AGSM students committed to attend the program.

During the summer 2014 semester, 8 BAEN students attended the program. No AGSM students attended the summer 2014 Belgium program.

During the summer 2013 semester, 13 BAEN students and 3 AGSM students attended the program.

During the summer 2012 semester, 5 BAEN students and 3 AGSM students attended the program.

During the summer 2011 semester, 3 BAEN students and 1 AGSM students attended the program.

During the summer 2010 semester, 9 BAEN students and 5 AGSM students attended the program.
MEXICO

The Mexico Exchange Program began in the late 1990’s by Dr. Wayne LePori and is an exchange program that has continued each year. Typical years involved two different sections where in the Fall students and faculty from the University of Guanajuato travel to the Texas A&M campus in College Station for a weeklong cultural and education exchange. During that trip each year our students are called upon to be heavily involved in this program and organize daily industry tours, provide housing for our guests, plan and execute nighttime social activities, assist as drivers and provide translation assistance. Typically over 20 TAMU students assist with the Fall program. Previous activities have included a tour of the LCRA power plant in La Grange, a tour of Minute Maid in Waco, a stop at the TAMU Howdy Farm, touring cotton gins and breweries in the central Texas region, an all-inclusive tour of Blue Bell Creameries in Brenham and a fun day at the capital in Austin. A new addition the past two years have been the inclusion of all student groups from AGSM to BAEN to the BAEN Graduate Student Association. This program provides valuable leadership experience for our students and reaffirms the connection our department has with the University of Guanajuato which has endured over the past several decades.

The second section of the Mexico Exchange Program occurs during the spring or summer semester where Texas A&M students travel to Guanajuato for a week long cultural and education exchange at our counterpart university in Mexico. Texas A&M students stay in host homes gaining experience in understanding how university live and work. During that same week students attend industry tours around the Guanajuato region. In May 2014, the department returned to the University of Guanajuato for the first time in 4 years. It is the departments goal to continue this summer trip so that students who may not be able to attend traditional study abroad opportunities can attend this shorter cultural and education immersion.

DATA AND METRICS

During the fall of 2013 semester the department hosted 8 students, 2 faculty members and 1 staff member from the University of Guanajuato, Mexico for the week of November 3rd through the 8th.

During the fall of 2014 semester the department hosted 9 students, 2 faculty members and 1 staff member from the University of Guanajuato, Mexico for the week of November 9th through the 14th.

In May 2014, the department sent 5 students and 1 staff member to the University of Guanajuato, Mexico.
CAPSTONE

Each May students from the Biological and Agricultural Engineering and Agricultural Systems Management undergraduate degree programs present various research projects that their student teams have worked on during the duration of their senior year to staff, faculty and industry leaders. The goal of the senior capstone course is to draw on the knowledge learned from the previous four years of study so that students can combine and tackle design, management and engineering problems.

DATA AND METRICS

Capstone was held May 2nd, 2012.

Capstone was held May 1st, 2013 and 20 undergraduate student groups participated.

Capstone was held May 1st, 2014 and 19 undergraduate student groups participated along with 6 graduate students who presented research work as well. Total number of posters was 25 which is an increase of 5 posters over the previous academic year. This year also saw the addition of Gold and Silver award competitions for each major.

Capstone will be held May 6th, 2015. Approximately 20 student groups will participate. This year will see the addition of student groups who are working in conjunction with student groups from Mexico and Ecuador on joint research projects. Gold and Silver award competitions will continue. This year the department is providing a $1000 scholarship to four BAEN capstone students so that their team can travel to Ecuador to better understand their research project and provide the necessary feedback to further develop their team project.

For more information refer to the Biological and Agricultural Engineering Undergraduate Program Self Study Report.
STUDENT ACTIVITIES

TEXAS A&M AMERICAN SOCIETY OF AGRICULTURAL AND BIOLOGICAL ENGINEERS STUDENT BRANCH

The ASABE student club is a branch of the national ASABE society. The student branch is intended for all BAEN majors but welcomes the membership of AGSM departmental students as well. It is governed by a student constitution whose objective is to promote leadership development and professional advancement of pre-professional members of the society, to promote interests and activities of the members and to promote the objectives of the greater ASABE society at the student branch level.

The ASABE student club holds monthly meetings on the second Tuesday of each month. Each meeting is presided over by the student leadership team who provides refreshments for student members and organizes a monthly industry speaker.

AGRICULTURAL SYSTEMS MANAGEMENT STUDENT CLUB

The AGSM student club is a departmentally developed student club designed to service the programs AGSM student group. While the student club is intended for all AGSM majors, the club welcomes the membership of other departmental students as well. It is governed by a student constitution whose objective is to acquaint members with the various opportunities that are available to AGSM students in industry, to develop leadership potential and create fellowship among student members and to promote student interest in agricultural engineering related fields.

The AGSM student club holds monthly meetings on the third Tuesday of each month. Each meeting is presided over by the student leadership team who provides refreshments for student members and organizes a monthly industry speaker.

BIOLOGICAL AND AGRICULTURAL ENGINEERING GRADUATE STUDENT ASSOCIATION

The BAEN GSA is a departmentally developed student club designed to service the departments graduate student group. While the student club is intended for graduate students in the department, the club welcomes the membership of other departmental students as well. It is governed by a student leadership team whose objective is to promote interests and activities of the graduate student members, to develop leadership opportunities and to create fellowship among student members.

The BAEN GSA holds monthly meetings at various intervals throughout the year. Each meeting is presided over by the student leadership team who provides refreshments for student members and organizes a quarterly graduate student social.
AGGIE PULLERS

The American Society of Agricultural & Biological Engineers (ASABE) started the International Quarter Scale (IQS) competition in 1997. The Texas A&M Aggie Pullers first entered the competition in 1998. The 1998 team didn't have any idea what a 1/4 scale tractor should look like. With some good ol' Aggie Engineering the team's first tractor worked quite well and met expectations. Over time the competition changed, and Texas A&M changed with it. Rumors passed down through the years even say some of these rules may have been implemented because the Aggie Pullers would push the envelope. Implementation of the sound test may just be proof of such rumors. In 2005, Texas A&M's tractor had a tuned exhaust making it almost unbearably loud. In 2006, the IQS developed stringent rules on how loud a tractor could be. The reason may never be known, nevertheless a good story to tell.

The team from Texas A&M has not missed a year since their start in 1998. Past teams have built everything from 4x4's to 6 wheeled tractors, CVTs and hydrostatics, single engine and multiple engine designs. In recent years the design has been streamlined in order to consistently build similar tractors with known performance histories. These smaller variations in design have helped the team grow both in knowledge and experience. Currently the team is building upon the previous year's design to develop a better tractor, making the Aggie Pullers a force to be reckoned with this coming year in Peoria at the national competition.

The team takes a lot of pride in what we build and welcome the opportunity to showcase our accomplishments by representing Texas A&M throughout the state and at national competition against other universities. One of the greatest achievements of all is receiving the sportsmanship award at the competition; this shows that our team is exemplifying the Aggie Spirit by lending a hand to other teams in need. Sometimes this may just be a wrench or a piece of metal, but either way others notice the class of the Aggies, which at the end of the day is our greatest achievement.

The Aggie Pullers receive support from high impact in the form of travel grants, conference fees and funds to purchase supplies.

DATA AND METRICS

In the summer of 2012, 8 students attended the ASABE Tractor Competition to compete and another 5 assisted with design and prototype development.

In the summer of 2013, 8 students attended the ASABE Tractor Competition to compete and another 5 assisted with design and prototype development.

In the summer of 2014, 6 students attended the ASABE Tractor Competition to compete and another 2 assisted with design and prototype development.
From left to right: Dr. Ronald Lacey, Kevin Edwards, Zackary Skrabanek, David Arthur, Nathan King, Tyler Green, Niao Yan, Dr. Stephen Searcy at 2014 ASABE ¼ Scale Tractor Competition in Peoria, IL.

From left to right: Zackary Skrabanek, David Arthur, Tyler Green at 2014 ASABE ¼ Scale Tractor Competition in Peoria, IL.
BAEN ROBOTICS TEAM

Every summer at the ASABE national meeting, student sections of ASABE from universities all over the country come together and solve an agricultural engineering problems using robotics. Here at Texas A&M, we are the Aggiebots and we use everything from micro-controllers and servos to metal work and 3D-printing as tools to build and program an autonomous robot. Student who are interested in electronics and programming are encouraged to participate. In the summer of 2014 the Aggiebots finished second in the overall competition and plan to finish first in 2015.

The Aggiebots receive support from high impact in the form of travel grants, conference fees and funds to purchase supplies.

DATA AND METRICS

In the summer of 2012, 3 students attended the international ASABE conference to compete and another 3 assisted with design and prototype development.

In the summer of 2013, 5 students attended the international ASABE conference to compete and another 4 assisted with design and prototype development.

In the summer of 2014, 3 students attended the international ASABE conference to compete and another 2 assisted with design and prototype development.
RESEARCH

In following with the University dedication to high impact, the Biological and Agricultural Engineering department has developed and provided special grants to several faculty-student teams who wish to pursue a designated research project. This past academic year the department provided 9 of these grants to students across the department. This fall semester the department has already provided 5 such grants and with several more months to go in the academic year the department is hopeful to provide many more. The aim of the grant is to encourage students to engage in research much earlier in their undergraduate career to help development more advanced skills and obtain a sense of what an advanced degree might entail. Ultimately, it provides another pathway for the student to interact with faculty and staff outside of the classroom and develop job related skills.

Below are just a few of things our students are working on right now.

Susana Cabrera, a BAEN Junior who is working with Dr. Zivko Nikolov, writes:

Bioseparation lab has become a “magnet” for BAEN students interested in bioprocess engineering

“The fact that humans have the potential to “grow” fuels, materials and therapeutic agents in biological systems fascinates me. I recognize the revolutionary nature of this idea as well as the improvements necessary to incorporate it to current manufacturing methods. The ongoing microalgae research in Dr. Zivko Nikolov’s Bioseparations Laboratory caught my eye even before I enrolled at Texas A&M. In fact, it helped me decide on a major as I filled my college application. Now, as an undergraduate member of the Bioseparations lab, I have been exposed to the involved task of designing a bioprocesses for the launch of algae as a biomanufacturing platform.

I started as a trainee in the Bioseparations Lab in the spring semester of 2014. In the summer of 2014 I was granted the opportunity conduct an independent research project in the lab by the USRG Program sponsored by the Dwight Look College of Engineering. The project focused on growing and processing of transgenic microalgae to isolate and purify recombinant malaria vaccine antigen.

The USRG program was a great opportunity to “get a glance” of graduate school as well as to learn how to think critically and solve problems independently. I am currently working towards the Engineering Therapeutics Manufacturing Certificate, offered through the BAEN department and the National Center for Therapeutics Manufacturing, which provides specialized training in the areas of biotechnology and bioprocess engineering. My goal is to gain the necessary skills enter the thriving biotechnology industry and contribute to solving some of the key challenges of our time.”

Past and current REU students in the Bioseparations lab using transgenic algae who worked with transgenic algae for the development of therapeutic protein products and biofuels byproducts include Francesca Moss, Logan Kostroun, Chelsea Dixon, Susana Cabrera, and Alejandra Cobos.
Dr. Carmen Gomes writes:

BAEN undergraduate students are increasingly showing interest in participating on research experiences with faculty in the department. Among participating students, I have Courtney Toler (1st form left) and John Abduhamad carrying out projects […] John and Courtney have been working on projects related to nanoparticle synthesis containing natural antimicrobials. John will be now working on engineering biomimetic nanobrushes for pathogen sensing using biopolymers and Courtney worked over this summer on polymeric nanoparticle synthesis to assist on protein separation. The picture below shows the Nanoscale Food Engineering group at 2014 IFT meeting (New Orleans, LO, July 2014).

From left to right: Courtney Toler, John Abduhamad, Kate Hills, Cassie Giacobassi, Daniela Oliveira, Rummy Sidhu at 2014 IFT meeting (Institute of Food Technologists, New Orleans, LO, July 2014).
DATA AND METRICS

Academic Year 2013-2014
    9 REU grants awarded for a total of $6,399.

Academic Year 2014-2015
    5 REU grants awarded as of February 3\textsuperscript{rd} for a total of $4,700.

TRAVEL GRANTS

In following with the University dedication to high impact, the Biological and Agricultural Engineering department has developed and provided special travel grants to students who wish to attend conferences, events and seminars around the nation. This past academic year the department provided 23 of these travel grants to students across the department. This fall semester the department has already provided 15 such grants and with several more months to go in the academic year the department is hopeful to provide many more. The aim of the grant is to encourage students to attend conferences where research can be presented and to engage in networking opportunities with industry leaders.

DATA AND METRICS

Academic Year 2013-2014
    23 travel grants awarded for a total of $9,299.

Academic Year 2014-2015
    19 travel grants awarded as of February 3\textsuperscript{rd} for a total of $7,920.
    6 pending applications as of February 3\textsuperscript{rd} for a total of $3,000.
2014-2019
Strategic Plan
Overview

Standing squarely at the intersection of the College of Agriculture and Life Sciences (COALS) and the Dwight Look College of Engineering (COE), the Department of Biological and Agricultural Engineering holds a unique position within Texas A&M University, Texas, the United States, and the world. Our Department is academically administered by COALS, and our ABET-accredited undergraduate program is aligned and coordinated with COE. As implied by our position at such an important crossroads, we apply engineering principles to agricultural, biological, and food systems to foster the production and processing of food, fiber, water, energy, and other life-sustaining resources. A global future in which 9 billion people will need sufficient quantities of nutritious and affordable food, adequate clothing, clean water, and secure employment is not only clearly visible from our Department’s vantage point but also central to our mission in Texas and beyond.

As a unit of a land-grant university formed under the 1862 Morrill Act, teaching, research, and cooperative extension continue to be the three primary functions that shape and define our mission. However, the priorities we identify and methods we use in fulfilling that three-fold mission must be responsive to the needs of the citizens of the State of Texas, the nation, and society as a whole. Our Department has been consistently ranked in the top five peer departments at land-grant universities over the last two decades. We intend to maintain and enhance that ranking over the next two decades by (a) anticipating the social, political, and institutional forces that will affect our ability to meet our mission and then (b) adapting to those forces with innovative, forward-leaning solutions.

Our faculty has examined the current status of the Department, the past and future trends that are likely to affect us, and our ability to achieve our threefold mission. To form a broader understanding of our institutional context, we have examined the Grand Challenges identified by Texas A&M University and the strategic plans of COALS, COE, Texas A&M AgriLife Research, and the Texas A&M AgriLife Extension Service, all of whom exert important influence on our strategic direction. We have also considered the expectations that the state’s citizens and industries have of our Department, and we have set forth a plan of action to meet those expectations over the next five to twenty years.

Core Capabilities. The Department’s faculty possess many of the areas of expertise, or core capabilities, within our professional discipline, including Power and Machinery (PM), Post-Harvest Processing (PHP), Renewable Energy (RE), Soil and Water (SW), Structures and Environment (SE), Food Engineering (FE), and Bioprocess Engineering (BE). In addition, Information and Emerging Technologies (IET) are integrated into each of those areas of competency to leverage the rapid advances in that field while preserving the traditional, legacy skills necessary to meet our goals. Departmental priorities are listed with respect to each Core Capability in Appendix A.
Strategic Challenges. Our department operates within a vast and diverse field of expertise, and the array of technical challenges we are called upon to solve is likewise vast and diverse. The strategic challenges we are especially equipped to address include food security, agricultural sustainability, data science, food safety, water security, air quality, energy sustainability, and waste management. These terms are defined later in the plan.

Strategic Goals. The following departmental strategic goals are proposed to meet these challenges:

1. Enhance graduate employability
2. Develop and implement emerging technologies in food and agricultural applications.
3. Prepare versatile, resilient, and globally globally-competent graduates.
4. Expand instructional diversity while maintaining high standards of excellence.
5. Expand multidisciplinary and integrated research and outreach programs
6. Expand current and develop new revenue sources.
7. Regain and expand capacity to meet growing extension education and lifelong learning needs.

Personnel and Infrastructure Requirements. Achieving our goals will require careful management of personnel and resources. The Department must sustain its core capabilities by attracting and retaining faculty with expertise in our strategic challenge areas, while integrating emerging technologies into legacy areas of engineering and management. Anticipated growth and the evolution of research into global, multidisciplinary efforts will increase faculty workload and staff requirements. Technology cannot mitigate all the challenges we face. Transforming existing spaces into laboratories and large-scale pilot facilities, in addition to improving technologies in our classrooms and laboratories, will require increased resources and personnel for the Department to remain in the top five agricultural and biological engineering departments in the nation.
Strategic Analysis

A committee of departmental faculty began our strategic planning process with an analysis of multiple strategic plans and documents from System institutions to ensure the maximum possible integration of our respective plans. This process also included a review of our historic mission and strengths and provided the framework for identifying the enduring and emerging core capabilities of the Department.

Core Capabilities: Although our faculty members are active in a wide variety of professional societies, our professional home is the American Society of Agricultural and Biological Engineers (ASABE). Of the eight core capabilities listed here, five correspond directly to ASABE’s “Technical Interest Areas,” formerly known as Technical Divisions. These ever-evolving areas result in core capabilities which have some common interests and may be further grouped into three functional areas: Machines and Energy, Natural Resources, and Food and Bioprocessing. Most of the core capabilities are well integrated with others in one or all of the functional areas. Examples of the overlap of the core capabilities, as well as their relationships within functional areas are shown in figure 1. Core capabilities that span two or three functional areas illustrate the interdisciplinary nature of our profession and represent one of our strengths in addressing current and future challenges. For example, within Power and Machinery there are areas of expertise in air quality which span to post-harvest processing, renewable energy, structures and environment, and environmental quality. Information and Emerging Technology is not confined to one area, but spans all the core capabilities. Appendix A provides the areas of priority for each core capability, which is intended to inform personnel, programming, and infrastructure decisions.

Figure 1. BAEN Core Capabilities have multiple areas of integration and overlapping application and may be generally grouped within the three Functional Areas listed at the top of this figure.
Strategic Purposes: The Department’s strategic purposes are derived from its historical activities and the strategic plans of agencies including Texas A&M University Vision 2020, COALS, COE, Texas A&M AgriLife Research, and the Texas A&M AgriLife Extension Service, as well as the COALS Grand Challenges. Each of those documents was analyzed with a goal of identifying the purposes and strategies that the Department is best poised to address effectively. Analyses of the agency-level strategic documents revealed key purpose statements related to BAEN and are shown in Appendix B. Many of these are complementary and support the Department’s mission and goals. While many of the strategic initiatives address educational issues, the BAEN key purpose statements are best summarized by three of the COALS Grand Challenges: Feeding the World, Improving Our Health, and Sustaining Our Environment. Figure 2 illustrates the proposed impact of our core capabilities on three of the Grand Challenges adopted by COALS. For example, the grand challenge of “Feeding the World” is met by the integrated efforts of BAEN Power and Machinery, Post-Harvest Processing, Soil and Water, Structures and Environment, and Food and Bioprocess Engineering core capabilities. Working together, these BAEN capabilities will have an impact on this challenge area.

![Figure 2](image)

**Figure 2.** The COALS Grand Challenges are met by the BAEN Core Capabilities as they overlap and integrate complementary functions. Many Core Capabilities work together to address each of the Grand Challenges.

Mission:

The Department of Biological and Agricultural Engineering prepares our society to protect and sustain the environment, improve health, and feed the world through innovative education, research, and extension programs in Machine and Energy Systems, Food and Bioprocessing, and Environment and Natural Resources.
Vision:

The Texas A&M Department of Biological and Agricultural Engineering will be recognized internationally as a premier department of its kind, known for faculty and graduates who devise solutions to global grand challenges in food, fiber, and environmental sustainability.

Strategic Challenge Areas

Our department has solved many problems by applying our core capabilities throughout the last century, including the development of the cotton module builder, high-efficiency irrigation technologies, rice drying, and the thermal conductivity probe. Building on these achievements, and identifying current and future societal challenges is key to determining our future strategic direction.

The major strategic challenges that our Department is uniquely equipped to address are:

**Food security and safety.** Ensure availability and access to a sufficient quantity of affordable, nutritious, and safe food.

**Air quality.** Ensure that the particulate and gaseous emissions originating from agricultural activities are not injurious to public health and welfare, do not negatively impact the environment, and encourage the economic viability of agriculture.

**Agricultural sustainability.** Producing and sustaining the food supply for global populations.

**Waste management.** Ensure pollutants from beef, dairy, swine and poultry concentrated feeding operations and sewage facilities are in compliance with environmental laws.

**Data science.** The development and use of specialized techniques for management, processing, and interpretation of large and/or complex data sets, often but not exclusively associated with large spatial scales or high time resolution (or both), as well as techniques for the acquisition of those data sets using rapidly advancing, remote sensing technologies.

**Energy sustainability.** Development of innovative processes for the sustainable production of power and transportation fuels.

**Water security.** Generally referring to “the capacity of a population to safeguard sustainable access to adequate quantities of water of acceptable quality”. The term thus integrates the more granular dimensions of availability, accessibility, adequacy, and quality, such that any deficiency in one dimension is understood to have reduced the overall security of a population’s livelihood, well-being, socio-economic development, and supporting ecosystems.
These strategic challenges are a more detailed look at the grand challenges facing our society, and can be viewed with respect to the grand challenges in Figure 3. Our department seeks to approach these challenges using an integrated approach, applying integrated solutions as much as possible. For example, the best solutions to food security, agricultural sustainability, and water quality challenges may be determined with an integrated view toward “Improving our Health.”

![Figure 3: The relationship of BAEN Strategic Challenges and COALS’ Grand Challenges.](image)

Table 2 demonstrates the primary relationships between the BAEN strategic challenge areas and the core capabilities that address them. For example, while all the Department’s core capabilities may be directed to solutions in agricultural sustainability and data science, food security and safety solutions will come primarily from Food Engineering, Bioprocess Engineering, and Post-Harvest Processing.

Table 2. BAEN Challenge areas and how each is addressed within the Department by each core capability.

<table>
<thead>
<tr>
<th>Strategic Challenge Area</th>
<th>BAEN Core Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Security and Safety</td>
<td>Food Engineering</td>
</tr>
<tr>
<td></td>
<td>Bioprocess Engineering</td>
</tr>
<tr>
<td></td>
<td>Post-harvest Processing</td>
</tr>
<tr>
<td>Agricultural Sustainability</td>
<td>All</td>
</tr>
<tr>
<td>Data Science</td>
<td>All</td>
</tr>
<tr>
<td>Water Security</td>
<td>Soil and Water</td>
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<tr>
<td></td>
<td>Structures and Environment</td>
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<tr>
<td>Air Quality</td>
<td>Power and Machinery</td>
</tr>
</tbody>
</table>
The department strives to be a pioneer in recognizing the intrinsic links between our core capabilities and strategic challenges and to integrate these to better manage and allocate resources. Examples include the “water-energy-food” nexus efforts that define and quantify the linkages among these core capabilities to promote unity of effort and long term sustainability.

**Department Strategic Goals**

Each of our department’s core capabilities have current strengths that must be reinforced as well as developing areas that need to be strengthened. These “priority areas” are listed by core capability in Appendix A, and should be used in the implementation of each of the following strategic goals within the department. The goals are intended to capture the strategic direction of agency level plans, while spanning both BAEN and AGSM programs in the department. Additionally, several key considerations were discussed to develop the department’s strategic goals. These considerations are shown in Appendix B. In support of our departmental mission and realize our vision, the following strategic goals are proposed:

1. **Enhance graduate employability.**
   
   Our graduates must be prepared academically for their chosen professions and equipped with necessary skills for the workplace. These areas will vary based on the needs of the employer. Some graduates will require engineering registration while others will need to be highly specialized in one core capability. Degree plans must be comprehensive enough to be versatile, specialized enough to be useful, yet not exceed 128 hours. Graduates must be able to address global needs in developing regions, while remaining competitive nationally. Ensure that an individual student’s degree-plan is appropriately suited to that student’s professional aspirations, ABET accreditation requirements, and the expressed expectations of the student’s likely employers.

2. **Develop and implement emerging technologies in food and agricultural applications.**
   
   The required expertise in legacy skills must be evaluated against the need for expertise in emerging technologies to ensure our graduates are equipped to address global challenges. Traditional engineering capabilities are especially applicable in emerging regions, while advanced systems are in demand in others. Additionally, there is a need to promote faculty development in emerging areas.
3. **Prepare versatile, resilient, and innovative graduates.**

Enhance and expand opportunities for students to participate in international educational, research, outreach, and service initiatives and programs which will enhance their ability to thrive in unfamiliar environments, develop unconventional thinking, and improve problem-solving abilities. Increase support for international and extracurricular opportunities to increase the breadth and depth of student involvement and learning.

4. **Expand instructional methodologies while maintaining high standards of excellence.**

**Curricular.** Assess, develop, expand, and improve experiential learning opportunities in undergraduate and graduate education. Increase support for curricular programs and classroom activities that strengthen planning, design, teamwork, leadership, professionalism, writing, and presentation skills.

**Extracurricular.** Increase support and emphasis at an institutional level for internships and extracurricular programs (Aggie Pullers, Fountain Wars, etc.) which enhance and expand the learning experience. Leverage and incentivize student leadership in these areas.

**Extended classroom.** Identify and develop distance education and online educational and extension opportunities. Ensure that our high standards of instruction and student learning are not sacrificed in the effort to expand our reach.

5. **Expand multidisciplinary and integrated research and extension programs.**

Global challenges such as water, food, energy, shelter, and health require integrative thinking that cuts across traditional disciplines. Increase research partnerships and center activities within the department and with others who complement our strengths and increase diversity of thought and innovation. Develop physical and organizational infrastructure needed for success in these areas, including additional personnel requirements. Expand and facilitate participation and leadership in multidisciplinary research teams.

6. **Expand current and develop new revenue sources.**

Leverage extension education to increase impact and visibility of departmental programs, staff to support this goal. Increase participation in licensing and commercialization of intellectual property by identifying departmental benefits, individual revenue potential, and institutional processes. Expand and leverage network of former students and industry groups to increase development efforts.
7. **Regain and expand capacity to meet growing outreach education and lifelong learning needs.**

Identify and recover critical expertise, educational programming, and information support needs of clientele (end users, technical service providers, and agribusiness) and prioritize gaps in subject matter expertise. Expand, develop, and deliver effective resources and programs in these areas.

**Personnel and Infrastructure Requirements**

Evolving teaching and research paradigms as well as projected departmental growth will require additional personnel and infrastructure in spite of the efficiencies of increased technology. Appendix A lists the areas of priorities in these areas by core capability. To maintain the department’s reputation for excellence and standing among our institutional peers, we must reinforce our strengths and meet a rapidly changing educational environment with proper resources.

**Personnel:** Sustaining departmental core capabilities within existing capabilities while adding emerging areas of expertise must be carefully managed. The need for legacy skills in emerging regions must be considered along with the need to progress and lead in areas of rapid technological development. Increasing growth rates in class sizes and number of sections is anticipated as COALS and COE both field aggressive growth plans for undergraduate and graduate students. Technology alone is not a solution; this will result in a need for increased faculty and staff. Simultaneous increased demand for distance education and online courses must be met with innovative solutions requiring specialized staff, equipment, and spaces. The shift to larger, collaborative, multidisciplinary research funding will increase administrative, managerial, and technical staff or faculty positions.

**Infrastructure:** The Department is fortunate to have a large footprint on campus; however, the current spaces are based on past needs and capabilities. Modification of these spaces to meet the need for modern chemical and biological laboratories, pilot plants for bioenergy and bioprocessing, as well as large-scale facilities will require planning, prioritization, and additional financial resources to support the core capability priorities in Appendix A. Existing equipment will need more frequently replacement as the obsolescence cycle increases with the rate of technological advances. Transformation of classrooms and lab spaces to state of the art delivery methods must be balanced with rate of change projections.

**Conclusion**

COALS stated desire to “Enhance faculty activities…” and “Enhance the student experience….” are central to the Department’s goals and will require significant resources to achieve. The University has entered a new paradigm of transformational delivery systems for education, evolving requirements for research efforts, and competing priorities for reduced
funding. Resource decisions must be made with a strategic view that emphasizes the Department’s ability to address key societal challenges using its unique core capabilities, while maintaining and expanding its solid reputation for excellence. This approach is essential to remain at the top of the list of agricultural and biological engineering departments in the nation.

BAEN is well poised to meet the challenges ahead for our society by applying our core capabilities to the problem areas identified above. We draw strength from our heritage while using innovative technologies to pursue solutions that will enable us to help feed our world, improve our health, and sustain our environment.
Appendix A: BAEN Core Capabilities

Addressing the Challenge Areas with BAEN Core Capabilities

In accordance with our core capabilities highlighted in the strategic Plan, the Department is equipped to provide teaching, research and extension activities to provide solutions in each of the strategic challenge areas listed in figure 3 of the Strategic Plan. Addressing the applicable challenge areas within its corresponding core capability promotes a focused approach to each of our essential tasks. The Strategic Planning Group identified the following major areas of emphasis within each core capability. The focus areas include our legacy skills which should be reinforced as well as emerging areas. Addressing our strategic challenges will be conducted using an integrated approach, however, priority areas are listed below by core capability.

**Power and Machinery**

*Challenge areas:* Agricultural Sustainability, Food Security, Data Science, Air Quality

Teaching

- Basic P&M material will continue, with increasing emphasis on integration of electronic sensors, controls, data acquisition, and data processing
- Classroom requirement for advanced technologies (Advanced CAD, computer-based manufacturing, rapid prototyping activities)

Research

- Spatial statistics; applied statistical analysis
- Remote sensing and precision agriculture applications
- Research funding primarily from private sector

**Post-Harvest Processing**

*Challenge areas:* Agricultural Sustainability, Air Quality, Energy Sustainability

Teaching

- Include legacy processing systems while integrating emerging technologies
- Addressing regulatory environment, energy use
Research

- Measurement and modeling emissions from Ag operations
- Emissions inventory; increasing regulatory pressures

Extension

- Center-based short courses on air pollution abatement systems and regulation
- Bioenergy generation at processing facilities
- Global outreach/training (currently via Borlaug/USDA)

**Renewable Energy**

**Challenge areas:** Energy sustainability

**Teaching**

- Fuel cells: fundamentals and applications
- Emerging conversion methods (bio-based)
- Modeling and simulation

**Research**

- Thermo-catalytic conversion
- Bioconversion/biorefining efficiency
- 3rd Gen fuel production (green hydrocarbons, etc.)
- Private sector funding

**Extension**

- Global outreach/training (currently via Borlaug/USDA)
- IP/commercialization revenue

**Soil and Water**

**Challenge areas:** Agricultural Sustainability, Water Security, Food Security, Data Science

**Teaching**

- Ecological engineering
- Chemical fate and transport in the environment
- Water conservation, recycle, and reuse (water management)
Research and Extension

– Water and wastewater management programs.
– Water recycling/reuse to alleviate water scarcity pressures
– Urban/rural interface; low impact development
– Water productivity and efficiency
– Emerging contaminants
– Linkages between water/food/energy
– Global studies, soil and water assessment
– Efficient soil and water resources management

Structures and Environment

Challenge areas: Food security, Waste management, Air Quality

Teaching

– Livestock and poultry environmental systems management

Research

– Remote sensing for environmental management
– Manure and wastewater treatment and reuse
– Indoor air quality; Air emissions from CAFOs, Ag facilities

Extension

– Animal manure and wastewater management
– Environmental quality and livestock systems
– Onsite sewage facilities management

Food Engineering

Challenge areas: Food safety and improving our health

Teaching
Food structures and design of functional foods
- Engineering aspects of packaging
- Design of processes for food safety and health

Research
- Micro- and nanoscale processes and emerging technology
- Intelligent packaging and new food structures
- Food safety and greener technology

Extension
- Distance delivery of current and new technologies to food producers, processors, and consumers

Bioprocess Engineering
Challenge areas: Food safety and improving health

Teaching
- Applications of metabolic engineering in agriculture
- Bioinformatics

Research
- Nanostructures and Biosensors
- Micro- and Nanoscale Processes and Emerging Technology
- Systems metabolic Engineering
- Biomaterials

Emerging outreach:
- National Center for Therapeutic Manufacturing (NCTM)
- Public/professional outreach re: biotechnology and biopharmaceutical manufacturing

Realizing that future challenges of water, food, energy, shelter and health are best addressed in an integrated manner, trans-disciplinary expertise that cuts across various disciplines are needed to help define these challenges and to train the young leaders who are capable of managing these complex issues.
Appendix B: Strategic Considerations

The goals in our strategic plan are intended to accomplish College- and Agency-level strategic imperatives as shown.

<table>
<thead>
<tr>
<th>Source</th>
<th>Strategic Direction</th>
</tr>
</thead>
</table>
| COALS Grand Challenges        | • Feed the world  
• Improve our health  
• Protect our environment                                          |
| COALS Strategic Plan          | • Elevate our faculty and their teaching, research, and scholarship  
  o Increase basic and translational research and build upon current areas of research strengths  
  o Strengthen faculty participation in interdisciplinary research initiatives and interdisciplinary research efforts  
  o Improve research facilities in high impact areas  
• Strengthen our graduate programs  
• Enhance the undergraduate experience  
  o Provide experiential learning opportunities that foster critical thinking, complex problem solving, strong communication skills, community interaction, and social/global awareness  
• Diversify and globalize the A&M and college communities  
• Build engaging connections beyond the University  
• Increase the transfer of intellectual property to private sector for commercialization of products and services.  
• Expand distance-education offerings |
| Dwight Look College of         | • Nurture and graduate students ready for professional practice of engineering  
  • Create, develop, and disseminate new knowledge and technologies  
  • Apply the results of the discovery process to enrich our education programs and to promote technology transfer and outreach  
  • Inspire students who can apply their knowledge to solve problems, foster entrepreneurship, and provide leadership in Texas, the nation, and the world |
| Engineering Strategic Plan     |                                                                                           |
| Texas A&M AgriLife Research   | • Develop new knowledge and tools through basic and translational research  
  • Expand agricultural sustainability, profitability, and environmental stewardship  
  • Sustain healthy ecosystems and conserve our natural resources  
  • Improve public health and well-being  
  • Mitigate negative effects of global climate change |
| Texas A&M AgriLife Extension   | • Improve the lives of people, businesses, and communities across Texas and beyond through high-quality, relevant education  
  • Ensure a sustainable, profitable, and competitive food, fiber and green industry in Texas  
  • Protect and conserve the natural resources of the State  
  • Improve the health, nutrition, safety, and economic security of Texas families |
| Service                        |                                                                                           |
While the mission and vision statements can be used to define our primary areas of focus, other areas of special consideration were used in addressing our strategic goals. Among these were employers of our graduates, competing instructional priorities for our students, and current departmental strategic assets.

One of our primary concerns is the placement of our graduates in the workforce. The Department must remain aware of the enduring and evolving characteristics expected of its graduates. Table 1 lists examples of major employers by categories, which include federal and state agencies, commercial agribusiness, electric utilities, water resource agencies, environmental companies, food industries and academia.

Table 1. Examples of current employers of the Department’s graduates.

<table>
<thead>
<tr>
<th>BAEN</th>
<th>AGSM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturing:</strong></td>
<td><strong>Agriculture:</strong></td>
</tr>
<tr>
<td>- Case IH</td>
<td>- Cotton and Grain Processing</td>
</tr>
<tr>
<td>- John Deere</td>
<td>- Monsanto</td>
</tr>
<tr>
<td>- Alamo Group</td>
<td>- Cargill</td>
</tr>
<tr>
<td><strong>Energy:</strong></td>
<td><strong>Energy:</strong></td>
</tr>
<tr>
<td>- Luminant</td>
<td>- Electric Coops</td>
</tr>
<tr>
<td>- Halliburton</td>
<td>- Oil and Gas</td>
</tr>
<tr>
<td>- Schlumberger</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental:</strong></td>
<td><strong>Logistics:</strong></td>
</tr>
<tr>
<td>- USDA and TCEQ</td>
<td>- Manufacturing</td>
</tr>
<tr>
<td>- Pape Dawson</td>
<td>- Service</td>
</tr>
<tr>
<td>- URS</td>
<td>- Construction</td>
</tr>
<tr>
<td><strong>Food:</strong></td>
<td><strong>Food:</strong></td>
</tr>
<tr>
<td>- McCormick</td>
<td>- HEB</td>
</tr>
<tr>
<td>- Proctor and Gamble</td>
<td>- Blue Bell</td>
</tr>
<tr>
<td>- Frito Lay</td>
<td></td>
</tr>
</tbody>
</table>

As evident from Table 1 the wide variety in the skill sets required by potential employers make the decision of essential skills needed by all of our students a difficult one. A majority of BAEN students are hired into the environmental and energy fields, areas that still provide opportunities for funding of research for the faculty that teach classes in these areas. A large number of students are still very interested in traditional agricultural engineering jobs, in areas that while important from a teaching prospective do not provide a lot of opportunities for faculty research. Compounding this problem is that most of the faculty in this area have retired or will be retiring in the near future.

In Spring 2013, the Dwight Look College of Engineering announced plans to expand college enrollments to 25,000 students by 2025. As part of this initiative each department in COE was
required to submit a growth plan detailing their plans to help meet this projected growth. Table 2 shows historical and projected growth in degree programs at all levels and for both the BAEN and AGSM degree programs. Part of the growth plan in BAEN addressed the use of distance courses to help reach a wider audience, particularly at the graduate level. However, one of the key assets of the BAEN curriculum is its use of experiential (hands-on) learning primarily through laboratory classes. Because of the dual nature of the engineering program (part of both COALS and COE) growth as part of the engineering initiative is unlikely to lead to additional resources to directly offset the increased workload on faculty needed to teach additional students or to develop new courses that can be offered at a distance.

Table 2. Recent and projected growth of enrolled students in BAEN and AGSM undergraduate and graduate programs 2007-2025.

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>2008</td>
<td>2010</td>
<td>2020</td>
</tr>
<tr>
<td>BAEN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.S.</td>
<td>135</td>
<td>227</td>
<td>261</td>
<td>300</td>
</tr>
<tr>
<td>M.S./M.E. On Campus</td>
<td>31</td>
<td>38</td>
<td>48</td>
<td>58</td>
</tr>
<tr>
<td>M.S./M.E. Distance</td>
<td>0</td>
<td>2</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>19</td>
<td>43</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>BAEN Total</td>
<td>185</td>
<td>310</td>
<td>374</td>
<td>448</td>
</tr>
<tr>
<td>AGSM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.S.</td>
<td>136</td>
<td>144</td>
<td>175</td>
<td>200</td>
</tr>
<tr>
<td>M.S. On Campus</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>M.S. Distance</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>AGSM Total</td>
<td>138</td>
<td>148</td>
<td>195</td>
<td>230</td>
</tr>
<tr>
<td>BAEN Department Total</td>
<td>323</td>
<td>458</td>
<td>569</td>
<td>683</td>
</tr>
</tbody>
</table>


Table 3 contains examples of competing priories facing the department. The primary pressure that the BAEN curriculum faces is providing the breadth of the skills and knowledge that are common to all engineering disciplines while providing depth in the specific areas that students require to meet their individual interests, career goals and industry needs. There are common competencies that employers expect engineers to have which are generally met through our ABET accreditation. This includes a minimum amount of math, physics, science and engineering science courses. Because of the dual name of our degree program we also have to meet two different sets of ABET program criteria, biological engineering and agricultural engineering. However, employers require a variety of skills and knowledge that are specific to their needs which are primarily covered in the electives that students choose to take. Many
employers, particularly in the environmental and natural resources area, require that graduates have the ability to become licensed professional engineers, which again necessitates that students are competent across the breadth of the engineering discipline. However, for those in food engineering and machine systems, professional licensure is not a high priority among employers who desire more specialized knowledge in discipline-specific areas.

The AGSM curriculum is one of the most diverse in the College of Agriculture, however, AGSM electives are not as numerous as BAEN. The curriculum provides a solid base in technical knowledge in power, energy, hydraulics, and pneumatic conveying systems, as well as business fundamentals. Students may choose up to 12 hours of technical electives to provide an area of specialization if they so choose, or work toward a minor in another field without the addition of many hours to the degree.

Designing a curriculum to meet the full range of expectations creates a challenging resource-allocation environment in which, due to limited teaching faculty resources, most classes are taught only once per year.

Compounding this duality of purpose is pressure from the State legislature, parents and the students themselves to fulfill their degree requirements within a 4-year time period with an upper limit of 128 student credit hours (SCH). 42 hours are required by the Texas Higher Education Coordinating Board to meet the Texas Core Curriculum including a minimum of 6 SCH of communication, 6 SCH of mathematics, 9 SCH of life and physical sciences, 3 SCH of language, philosophy and culture, 3 SCH of creative arts, 6 SCH of American history, 6 SCH of government/political science and 3 SCH of social and behavioral sciences. BAEN requires an additional 11 SCH of mathematics, 10 SCH of life and physical sciences, 25 SCH of foundational engineering courses, 27 SCH of foundational BAEN courses which leaves on 12 SCH for electives in the student’s area of interest.

Table 3. BAEN competing priorities.

<table>
<thead>
<tr>
<th>Breadth of Curricula</th>
<th>Depth of Curricula</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABET Accreditation in Biological Engineering</td>
<td>ABET Accreditation in Agricultural Engineering</td>
</tr>
<tr>
<td>Maximum of 128 SCH for B.S.</td>
<td>Specialization</td>
</tr>
<tr>
<td>Experiential (hands-on) learning</td>
<td>Distance/online classes</td>
</tr>
<tr>
<td>Professional registration required for some BAEN careers.</td>
<td>Professional registration not important to some BAEN careers.</td>
</tr>
<tr>
<td>Pressure to increase student numbers.</td>
<td>Increased teaching workload with no net</td>
</tr>
</tbody>
</table>
increase in teaching resources.

| **Pressure on faculty to do research (write proposals, work with graduate students, publish etc.)** | Pressure on faculty to teach increasingly more students with less resources. |
| **Need for faculty research in emerging areas to maintain relevancy.** | Need to maintain faculty expertise in some legacy areas. |
| **Expectations of extension clientele** | Limited personnel numbers and fiscal resources available |
| **Desire of faculty to participate in technology transfer** | Complexity of technology transfer process |

A departmental inventory of major assets is a strategic consideration that informed us of industry groups who have committed financial resources to our Department to meet their enduring needs (Table 4). Some of these assets, such as endowed chairs, are easily quantified, while others, such as the network of former students, are extremely valuable despite not having an easily defined net worth. Endowed Chairs in Water and Cotton reinforce the department’s ability to continue research and instruction in these areas. The department’s facilities are relatively large and spacious, however, are still oriented toward past emphases. They will need to be repurposed to facilitate research and instruction in a more rapidly changing agricultural environment. The COALS Grand Challenges indicate the move toward larger, interdisciplinary research efforts, facilitated by Centers or similar programs. Our department has the CAAQES which has the knowledge, experience, and equipment base to bring together faculty from multiple core capabilities as well as other disciplines and institutions; similar efforts should be considered. Extramural involvement in other Centers is also encouraged and our faculty is already participating in this.

Table 4. BAEN Strategic Assets.

| **Facilities:** | Multiple Specialized laboratories  
Small Scale Cotton Gin  
EPA approved Wind Tunnel  
Brazos River Experimental Farm Plots  
Machine Shop  
Location and Space on Campus |
| **Centers:** | The Center for Agricultural Air Quality Engineering and Science |
| Endowments:                        | Lehr Water Chair                        |
|                                  | Cotton Engineering, Ginning, and Mechanization Chair |
|                                  | Dow Chemical Professorship              |
|                                  | COALS Water Chair                       |
| Intercollegiate Faculty:         | TAMU Energy Institute                   |
|                                  | Water Management and Hydrologic Sciences Program |
|                                  | National Center for Therapeutic Manufacturing |
|                                  | Texas Water Resources Institute         |
|                                  | Food Science Technology Center          |
|                                  | MEPS                                   |
PROCESS MANUAL FOR THE BIOLOGICAL AND AGRICULTURAL ENGINEERING DEPARTMENT
Article I. NAME

The name of this organization shall be the Biological and Agricultural Engineering Department (abbreviated BAEN), henceforth called the “Department”. The Department is an academic department of the College of Agriculture and Life Sciences (COALS) and is affiliated with the Dwight Look College of Engineering (COE), Texas A&M University. It is a unit of Texas AgriLife Research, program unit number 730 of the Texas AgriLife Extension Service and the Agricultural Engineering Division of the Texas Engineering Experiment Station (TEES). These agencies are all constituent divisions of the Texas A&M University System (TAMUS).

Article II. PURPOSE AND AUTHORITY

This process manual provides for the administrative organization and procedure of the Department. This process manual derives its authority from its adoption by the full faculty of the department. These processes are an extension of TAMUS policies and procedures and, as such, they must accord with those policies and rules. In case of disagreement, the TAMUS policies and the laws of the State of Texas shall prevail.

Article III. MISSION

Provide quality education, research and extension in engineering and technology for the world’s agricultural, biological, environmental and food systems.

Article IV. FACULTY MEMBERSHIP

Section 4.01 Scope

Membership in the Faculty of the Department of Biological and Agricultural Engineering is defined for the purpose of voting and communication on issues relating to the department.

Section 4.02 Categories of Membership

The full faculty of the Department includes individuals with a majority appointment in BAEN and with an academic title of distinguished professor, professor, associate professor, or assistant professor. Individuals with majority appointments in BAEN as Distinguished Lecturer, Senior Lecturer, or Lecturer are also members of the full faculty. Other categories of membership include affiliated, research, collaborating, adjunct, and emeritus as indicated in the following table.

<table>
<thead>
<tr>
<th>Category</th>
<th>Home Department*</th>
<th>Ad Loc in BAEN</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full</td>
<td>YES</td>
<td>YES</td>
<td>Teaching, Research, Extension Faculty with majority appointment in BAEN</td>
</tr>
<tr>
<td>Category</td>
<td>Home Department**</td>
<td>Ad Loc in BAEN</td>
<td>Example</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------</td>
<td>----------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Affiliated</td>
<td>YES</td>
<td>NO</td>
<td>Primarily research appointment at a R&amp;E Center with 0% or minority appointment to BAEN. BAEN is the disciplinary home and the promotion and tenure review of these affiliated faculty are conducted by the BAEN P&amp;T Committee.</td>
</tr>
<tr>
<td>Research</td>
<td>YES</td>
<td>YES</td>
<td>Majority appointment in BAEN with primary emphasis in Research, non-tenured or non-tenure track. All or some of the appointment is typically funded from non-state appropriated funds.</td>
</tr>
<tr>
<td>Collaborating</td>
<td>NO</td>
<td>NO</td>
<td>0% or minority joint appointment with BAEN and majority appointment with another department at TAMU-CS, who collaborates closely with BAEN</td>
</tr>
<tr>
<td>Adjunct</td>
<td>NO</td>
<td>NO</td>
<td>Member of a government agency, company, etc. qualified to contribute to the dept.</td>
</tr>
<tr>
<td>Emeriti</td>
<td>N/A</td>
<td>N/A</td>
<td>Former faculty of BAEN given title of emeritus of BAEN after retirement.</td>
</tr>
</tbody>
</table>

*Faculty who have BAEN as the home department have their promotion and tenure reviews conducted by the BAEN P&T Committee. Full faculty may serve on the BAEN P&T committee if they meet the requirements but Research Faculty do not.

Faculty with an administrative appointment shall not participate in any decisions where the authority of their position will give them undue influence on the result. For example, administrators should not vote on matters for faculty under their supervision. This does not apply to associate heads.

If there is a question about which category someone falls into, the departmental head will decide. Only full faculty will vote on departmental governance issues. Affiliated, research, adjunct, collaborating, and emeriti faculty are encouraged to provide advice to the department, but have no governance responsibilities or privileges. Full faculty are selected as described in Article IX, affiliated faculty are appointed by the agriculture program administration, collaborating faculty are appointed by the head, adjunct and emeriti faculty are appointed according to procedures given in university regulations. To be appointed as an adjunct professor, the person must be sponsored by a faculty member and there has to be a clear benefit to the department. There is an expectation that Adjunct Assistant, Associate and Full Professors will continually be active in Department Missions. We expect adjunct faculty to be active in at least one of the activities below, each year:

- On-going research collaboration with one or more full faculty in the department.
- One or more lecture(s) in a class per year.
- Service on a departmental committee or a graduate student’s committee.
- Other activity in the department which would bring you to campus at least once a year to interact with departmental faculty, e.g. attendance at a departmental faculty meeting or other function.

The title of Adjunct is a temporary title and will expire in 3 years after appointment. They can be re-appointed after a review of their activities with the Department. This review will be done by the Faculty Advisory Committee. Adjunct Professor
rank should be consistent with expectations for the different ranks of full faculty and will be determined by the department head upon appointment. Adjuncts may participate in department meetings and activities but are non-voting members.

Membership in the promotion and tenure committee is discussed in Section 8.01(a).

Graduate Faculty membership categories and associated privileges are determined by the Office of Graduate Studies as documented in the Texas A&M University Graduate Catalog.

**Article V. GENERAL ORGANIZATION**

The Department shall be organized with a head as chief administrator. The head shall have those powers and duties designated by the Vice Chancellor of Agriculture and Life Sciences (Expectations of Department Heads in the Coordinative and Shared Governance of Statewide Research and Extension Programs) and such other powers and duties required to lead the unit.

**Section 5.01 Administrative Team**

The administrative team shall consist of the head and associate heads appointed by the head. The administrative team will address departmental administrative topics and provide advice to the department head. The associate heads will report regularly to the team about the status of their areas of responsibility and on special projects assigned by the department head. The associate heads are responsible for providing leadership to all matters concerning the department; however, they will also have specific responsibilities as follows:

The extension associate head shall serve as the program leader of extension for the department. As such, he/she shall represent BAEN at administrative extension meetings and provide leadership for all BAEN faculty with an extension appointment. The extension program leader will assist faculty with extension appointments in developing quality programs and will monitor their progress in producing quality extension products. He/she will assist the department head in evaluations of faculty with extension appointments.

The teaching/research associate head shall provide leadership to the department on all teaching and research matters. He/she will assist in evaluations of faculty with teaching and research appointments. He/she shall monitor activities of the undergraduate curriculum and graduate committees to ensure quality teaching programs, and will ensure that progress is made towards meeting ABET requirements. He/she will monitor all teaching/research infrastructure and make recommendations for improvement.

**Article VI. FACULTY RIGHTS AND RESPONSIBILITIES**

As the responsible body in the teaching, research, extension, and public service activities of the department, the faculty has inherent responsibilities and rights in academic policy and governance. Members of the full faculty share the responsibility to maintain high professional standards that foster academic excellence and to maintain a strategic plan to guide future direction of the department. All departmental policies and regulations dealing with the following matters shall be approved by the department’s full faculty before being approved by the department head and/or higher administrative authorities:

1. Policies and requirements relating to the department’s curricula and teaching programs.
2. Policies dealing with academic standards, including admission, graduation, and retention.
3. Policies and procedures dealing with hiring, tenure, promotion and annual evaluation of faculty.

The full faculty will advise regarding issues of program planning, appointment and evaluation of members of the administrative team, physical plant and facilities and other matters affecting the general welfare of the department.
Section 6.01  Expectations of Full Faculty Members

Full faculty members are expected to participate in the broad mission of the department including teaching, research and extension. Each full faculty member will have a primary area of excellence which is usually research or extension depending on their appointment. Occasionally the area of excellence may be teaching if worked out in agreement with the department head. Excellence is expected of faculty in all matters. Faculty members with an academic title of professor, associate professor or assistant professor are encouraged to either be a registered professional engineer (P.E.) in the United States or be actively in the process of obtaining their professional engineering license. The items listed in the following sections (a, b, c, d) are expectations of faculty in the various missions. Not all of these apply to each faculty member.

(a)  Teaching Mission (based on Criteria for Post-Tenure Review Process)

- Regularly update course materials; update lectures to include new information; develop improved laboratory exercises or classroom demonstration; obtain new equipment or resources that allow for improvement of course materials; bring fresh examples or materials from industry by way of guest speakers, case studies, videos, field trips, etc.

- Ensure effective interfacing of courses with preceding and following courses; maintain syllabi from these courses; reinforce concepts from preceding courses which should be reinforced; develop base needed for critical concepts in following courses.

- Provide engineering design component in BAEN courses and management in AGSM courses, establish desired level of design/management emphasis for courses; introduce design/management activities in courses as needed to achieve desired level.

- Make efforts to evaluate and improve personal teaching style; e.g., conduct critical evaluation, give midterm teaching evaluation and respond to student concerns, participate in teaching methods, workshops and seminars, have Center for Teaching Excellence videotape and evaluate your course.

- Demonstrate a level of rigor appropriate for the course prerequisites or level; incorporate biological sciences into BAEN courses as appropriate, or provide example of interaction between engineering and biology; incorporate high level mathematics in examples and assignments; include assignments emphasizing professionalism and communications skills; include an appropriate level of design or management experience; develop laboratory exercises which require active student involvement.

- Give students experience with modern engineering and management tools; give assignments which require the use of computers in unstructured problem solving; demonstrate the use of state-of-the-art tools and techniques in your class.

- If needed, develop new or significantly revise permanent or special topics courses; develop a new course as a part of curriculum revision.

- Demonstrate a concern for student mastery of the subject matter in your course; use innovative testing techniques which emphasize learning the material or problem solving processes rather than memorization; develop additional study materials and examples for student use; evaluate examination tools for clarity and relationship to course objectives.

- Develop instructional materials to meet the needs of your course; write material for a course which does not have an adequate text available; develop audio, video or computer-based instructional materials; develop computer or multimedia-based classroom presentations; develop new lab activities.

- Show concern for overall student development and learning outside the classroom; make yourself available to students outside of class; actively participate in student clubs and activities; provide
counseling and advising to meet specific student needs; assist in student placement by arranging for interviews for summer or permanent employment.

- Demonstrate effective classroom preparation, interaction and delivery of course content; receive student evaluations which are consistently high or show an improving trend; regularly communicate to students the objectives and expectations for assignments; provide fair, accurate, and timely feedback to students on graded assignments; use a variety of instructional methods in order to aid learning and stimulate students; demonstrate advance preparation for class meetings by having handouts, worked examples, etc.

- Serve on graduate advisory committees by chairing and/or directing graduate student programs.

(b) Research Mission

- Independent and original basic and/or applied research which is part of a well planned and developed program; participatory role in strong multidisciplinary research.

- Publication of research in scholarly and professional refereed journals, peer-reviewed scientific publications, as well as the transfer of technology and information to popular press articles, research application bulletins, textbooks, educational software, teaching materials, book chapters, and editing, among others.

- Research funding from external sources.

- Presentation of research activity at invited seminars and professional/scientific meetings.

- Maintenance of effective relationships, sharing of information, and transfer of technology to government and industry leaders, scientific panels and other research user groups.

- Research should contribute to the advancement of knowledge or produce tangible benefit to society.

(c) Extension Mission

- Extension faculty are expected to develop strong programs in extension, scholarly activities, and service. They are expected to develop an area of expertise addressing a critical issue for our clientele, i.e., they must develop a focused area of excellence. An area of excellence in extension and scholarly programs is an area where they will achieve or have achieved national/international recognition as one of the top experts in that specific area.

- Develop programs consisting of appropriate educational methods designed to efficiently transfer information to the targeted clientele. Conduct a thorough evaluation in order to select the most effective teaching methods based on the information to be transferred. Extension faculty should periodically make a thorough assessment of which clientele to target. Next they need to make a thorough evaluation as to the most efficient/effective method of delivering knowledge to the targeted clientele. They will usually need to continue some of the traditional methods of extension outreach such as phone calls, presentations at meetings, demonstrations, etc. This helps them stay in contact with county extension agents, producers, etc. However, with reductions in travel funds and more demands on their time, the traditional methods are not appropriate as the sole delivery methods. Extension faculty should explore methods to increase impact by using delivery methods that can reach large numbers of targeted clientele at lower delivery costs.

- Demonstrate an established program of excellence in a focused topic area by: widely used extension publications or other media, invited lectures, service to industrial/commodity organizations and government agencies, and demonstrated interactions with county extension agents and targeted clients.
A program of excellence must include written material or other appropriate media that efficiently deliver a complete message to the clientele. These significant extension products should demonstrate that they have moved the knowledge base forward in the subject area. Examples would include brochures, booklets, training manuals, videos, and web sites. Any form of peer evaluation or recognition of quality extension materials are highly desirable, e.g., ASABE Blue Ribbon Awards.

- Extension faculty members usually have to spend a lot of their time consolidating existing knowledge for their clientele. However, they are also expected to generate and deliver new knowledge in their area of excellence. This is best accomplished with a quality research program that is focused in their area of expertise. To be accepted as a quality research program, proof is needed that our peers accept it as quality research. The most accepted form of proof is to have the results published in peer reviewed journals. A significant number of the publications need to be in the focused area of excellence in order to show that a program is being established in that topic area.

(d) Public Service Mission

- Service to the Department, College, University, and Texas A&M Agriculture Program through leadership and involvement on various committees, advisory groups, task forces, student clubs, etc.
- Contributions and service to professional disciplines and scientific societies.
- Service to the “community” through community development and continuing education.
- Professional support and involvement with county, city, state, regional, and federal levels of government.
- Service and contributions to industry and commerce.
- Involvement and contributions to economic and cultural development through international partnerships and collaboration.
- Maintenance of strong cooperative and coordinative relationships with colleagues and across disciplines at the Agency, College, University and Agriculture Program level.

Article VII. FACULTY MEETINGS

Meetings of the faculty generally shall be called by the head approximately three times per semester during the academic year and whenever else necessary. All faculty in all categories are invited to attend; all full faculty are expected to attend or participate via conference call. The head shall chair meetings. If the head is absent, an associate head shall be designated by the head to preside. Special meetings may be held at the call of the head. All full faculty present at a properly called meeting shall constitute a quorum. All formal votes taken by the faculty will be recorded and reported to the full faculty within 10 working days after each meeting.

A notice (including the agenda) of a meeting shall be distributed to the full faculty about a week in advance. Faculty meetings usually will be conducted informally but if motions are under consideration, the meeting shall proceed according to Robert’s Rules of Order Newly Revised. When possible, the written motion will be published and distributed as a component of the agenda. A secret vote shall be taken whenever requested by a majority of full faculty present at the meeting or at the discretion of the head. A full faculty member may request that their specific vote be recorded with the general results of the vote. Each full faculty member shall have one vote on each question.

There shall be no proxy voting; however, full faculty members may submit early votes to motions published on the agenda. Motions may also be voted upon electronically outside of regularly scheduled faculty meetings at the discretion of the head, provided that the motion was discussed within a faculty meeting, or posted for electronic discussion for 2 days before calling for a vote.
Article VIII. COMMITTEES

The department shall have committees to conduct the business of the department. Committee participation is an expectation of every member of all categories of the faculty. In addition to the standing committees, ad hoc committees may be formed and appointed at the discretion of the department head. All discussion within a committee meeting is assumed to be confidential to that committee. The committee may decide as a group which informational items to release outside the committee.

Section 8.01 Standing Committees

There are currently the following standing committees: Promotion and Tenure, Faculty Advisory, Graduate Programs and Recruiting, Engineering Undergraduate Programs and Recruiting, AGSM Undergraduate Programs and Recruiting, Infrastructure, Development Coordination, Recognitions and Events, International Programs, Safety and Scholarship. The Head will not serve on any of these committees, but the associate heads are eligible for all committees. With the exception of the promotion and tenure committee, members of standing committees are appointed by the head.

(a) Promotion and Tenure

Mentorship:

Faculty members at the assistant professor rank will be assigned an official mentor by the department head. The mentor and the assigned faculty member should meet regularly throughout each year, and the mentor should, among other things, provide guidance on how to meet the expectations for promotion and tenure. The mentor should also act as a liaison to the P&T Committee and to the department head, and report the progress of the faculty member on an annual basis as well as give feedback from the P&T Committee to the candidate. All faculty members are encouraged to seek mentors, both internally and externally, to enhance their professional development.

Teaching/Research Faculty Evaluation Criteria:

In general, teaching/research faculty members are expected to do very well in all three missions of research, teaching and service. However, they are expected to be excellent in at least one of these areas, usually research. The area of excellence can be teaching, if that is agreed upon by the candidate and the department head, and if this shift in expectation is stated in recent annual evaluations. Candidates for promotion and/or tenure will be evaluated based on criteria that are discussed in the College of Agriculture and Life Sciences “Guidelines and Time Lines for Tenure and Promotion.” The following evaluation criteria are in addition to or clarifications of the College evaluation criteria. The candidate should provide evidence in their promotion dossier to demonstrate that they have met these criteria.

- **Research**
  - Publications
    - A balance between
      - Quality and quantity
      - Accomplishment and direction
    - Impact of publications – with particular attention to the prestige of the journal
    - Number of publications – what has been accomplished and the direction of publications
    - Evidence of leadership – 1st author or graduate student(s) are 1st author
    - Indication of contribution (%) in multi-authored papers
    - Publication in peer-reviewed education journals is considered to be a research contribution.
    - For those candidates applying for promotion to Full Professor
      - A record of continuous publication
        - Although there may be extenuating circumstances that need to be considered, in general it is expected that candidates should have an average of at least 2 publications per year since the last promotion and/or receiving tenure. It is expected that most
peer-reviewed articles will be published in journals that are regarded as high quality for the topic area.  

*Note:* Publication types need to be separated by category with decreasing level of importance – refer to the metrics of College of Agriculture and Life Sciences/Texas AgriLife Research.

- **Grantsmanship**
  - A balance between success and effort towards securing competitive grants
  - Evidence of grants being written and submitted by the candidate
  - Evidence of leadership as PI on funded projects and submitted projects, especially for promotion to Full Professor

  *Note:* Grants and contracts need to be separated by category with decreasing level of importance – refer to the metrics of College of Agriculture and Life Sciences/Texas AgriLife Research.

- **Graduate Students**
  - Consistent advising and supervision of graduate students
  - Consistent successful completion of student’s graduate degrees
  - Successful completion of some PhD students

- **Impact of scholarly work**—possible indicators of impact can include:
  - Awards
  - Number of invited presentations
  - National and international recognitions
  - Intellectual property
  - Invited papers/chapters

- **Teaching**
  - **Courses**
    - Candidates applying for promotion/tenure to Associate Professor
      - Evidence of development, revision, or upgrade of at least one course (undergraduate or graduate level).
      - Develop or be responsible for at least one graduate level course in their area of expertise (stacked courses are included in this requirement)
      - Participate in teaching improvement activities
    - Candidates applying for promotion to Full Professor
      - Evidence of ongoing development, revision and strengthening of existing courses
      - Development of new courses as appropriate
  - **Evidence of effective teaching**
    - Peer-evaluation at any level as dictated by the most recent version of the Texas A&M University “Tenure and Promotion Procedure.”
    - Student evaluations (*Note:* although student evaluations are very important, more weight will be given to high-quality peer evaluation)
    - Although not required, any recognition for teaching excellence, development of educational materials, or invited presentations on teaching are evidence of effective teaching.

- **Service**
  - Candidates applying for promotion/tenure to Associate Professor
    - Evidence of leadership in professional societies
    - Evidence of participation on department, college and/or university committees
    - Contribution to the peer-review process. Some examples are:
      - Journals – reviewer of papers
      - Proposals – reviewer
o Candidates applying for promotion to Full Professor
- Evidence of international recognition
- Evidence of leadership in department, college and/or university committees
- Evidence of leadership in professional societies
- Leadership in the peer-review process. Some examples are:
  - Associate Editor/Editor of Journals
  - Serve on Proposal Review Panel

Extension (Outreach), Research, and Service Evaluation Criteria:

- **Research**
  The same evaluation criteria are generally the same as discussed earlier for teaching/research faculty. However, the number of publications must reflect the candidate funding source appointment distribution. Although working with graduate students is encouraged, consideration must be given to the fact that some faculty at Agricultural Research and Extension Centers may have limited access to graduate students. The same expectations as given earlier for teaching/research faculty are required for “Grantsmanship” and “Impact of Research/Work,” regardless of funding source appointment.

- **Outreach**
  o Development and Delivery of Extension Products
    - Evidence of development of new products and revision or upgrade of materials to reach targeted clientele appropriately (multi-media, presentations, demonstrations, curriculum, websites, fact sheets, bulletins, training manuals, etc.) on an ongoing basis.
    - Evidence of delivery of information to the targeted clientele (web contacts, phone, email contacts, site visits, class, meetings, contact hours, etc) on an ongoing basis.
    - For promotion to full professor, must demonstrate that at least one complete program has been developed from problem and client identification through to delivery of extension products to targeted audience.
    - Evidence of effective outreach (impact of extension programs)
      - Peer-review evaluation
      - Surveys and clientele evaluations

  o Extension Products
    - A balance between
      - Quality and quantity
      - Accomplishment and direction
    - Impact of publications – with particular attention to the prestige of the journal
    - Number of publications – what has been accomplished and the direction of publication
    - Evidence of leadership – 1st author or graduate student(s) are 1st author
    - Indication of contribution (%) in multi-authored papers

  o Impact of Research/Work
    - Awards
    - Number of invited presentations
    - National and international recognitions
    - Invited papers/chapters

- **Service**
  The same expectation required for the Teaching faculty
Note: Affiliated faculty with a majority funding source appointment in Texas AgriLife Research will be evaluated by the criteria presented in the Texas AgriLife Research section of the College of Agriculture and Life Sciences “Guidelines and Time Lines for Tenure and Promotion.

P&T Committee Membership:

- The Promotion and Tenure (P&T) Committee shall be composed of all full and affiliated faculty members with the academic title of professor and associate professor, who are dedicated to this important function. The head shall not be a member of the committee, but the associate heads may be. Each member must be dedicated to thoroughly reviewing each promotion document, participating in all P&T meetings (by attending or via conference call), and voting every time they are eligible. Members can voluntarily opt out of the committee by notifying the department head. If a member does not actively participate in the P&T process and/or does not vote without good reason, the department head will be obligated to remove them from the P&T committee. If members cannot participate in the P&T meetings, they should talk to the department head prior to the meetings.

- Associate professors on this committee shall be concerned only with promotion decisions on individuals being considered for the ranks of instructor, assistant professor, and associate professor, whereas professors shall be concerned with all ranks. Only tenured faculty members of this committee may vote on tenure. Votes for promotion, should be separated according to tenure status when the final vote is submitted to the department head.

- Each year, the committee will elect a full tenured professor as the chair by June 15.

Going up for Promotion/Tenure:

- During the annual faculty performance reviews, the head will work with potential candidates and advise them as to their apparent readiness for promotion and tenure. The head will provide the Promotion and Tenure committee chair with a list of candidates to be considered for promotion and/or tenure during that year prior to the start of the academic year. Candidates may always opt to place themselves on the list.

- The department head will coordinate the collection of external evaluation letters and the candidate’s dossier, and these will be submitted to the P&T committee for evaluation. This process will include sources suggested by the candidate and will avoid sources indicated on the candidates “do not ask” list.

- Extension dossiers should be prepared using a format similar to the Teaching/Research dossiers to facilitate evaluation of Extension faculty by non-Extension faculty.

- The P&T committee is also responsible for conducting mid-period reviews of progress of new full faculty as dictated by University policy and report the evaluation to the faculty member and the department head.

P&T Process:

- All proceedings of the promotion and tenure committee will follow university and college guidelines.

- The P&T Committee shall have broad powers to consult with appropriate faculty and other persons on matters concerned with evaluating faculty for promotion and tenure.

- The committee recommendations must be based on a set of written tenure and promotion evaluation criteria. The BAEN Department evaluation criteria are given above and are in addition to the evaluation criteria published by the College of Agriculture and Life Sciences in the document titled “Promotion and Tenure Recommendations.”
The candidate’s dossier including the candidate’s statement, curriculum vitae, and draft reports for teaching, research, service and extension will be distributed to the P&T committee members prior to the committee meeting.

The P&T committee members shall review dossiers of candidates prior to the meeting. Voting on whether promotion and/or tenure should be granted will occur at the meeting.

Meetings will be structured to ensure that everyone has an opportunity to express their opinion in-turn without interruption from others. Discussion will be held openly and confidentially within committee meetings. Voting will be by secret ballot and every effort will be taken to ensure that confidentiality of the votes will be maintained. Two people will count each vote and will compare the results with each other immediately to ensure that they match. One of the vote counters will be the P&T Committee chair and the other one will be elected from the P&T Committee at the start of the meeting, and must be eligible to cast all votes that will be counted.

Draft reports will be revised based on discussion at the committee meeting and submitted to the P&T committee Chair.

As per Item 9 of Dossier Items of the University Tenure and Promotion Procedures, the BAEN P&T Committee must submit a report for the dossier to convey the meaning of the vote. Prior to submitting the final report to the department head, the Chair of the P&T committee will distribute the revised reports, the committee vote (in percentage format only), and the summary comments (including disagreements) to explain the vote to the P&T Committee for final comment. The report to the committee will indicate only the percentage of the votes that were cast that favored, opposed, and abstained, without separating by rank or tenure status. When votes are cast for both tenure and promotion for the same candidate, report one set of percentages for each.

Final comments will be incorporated into the reports as necessary and the documents forwarded to the department head. The final report should include a table of the committee votes by category (tenure status). The final report should also include a statement that all committee members concur with that report. The vote of the P&T Committee reported on the dossier cover sheet should include only the tenured-faculty votes for dossiers submitted to the Dean of Faculties.

(b) Post-tenure review

The BAEN department will follow University and COALS policies for post tenure review. The guidelines and procedure for post-tenure review are incorporated in University Rule 12.06.99.M1 and are further defined by the COALS statement on Criteria for Post-Tenure Review of Faculty. The BAEN implementation of these rules are summarized below.

Annual reviews of all faculty are to be conducted by the Department Head and each faculty member will be given a performance evaluation ranging from “most meritorious” to “unsatisfactory.”

A peer review of each faculty member’s performance will be incorporated into the annual review no less than once every six years. A three person peer review committee will provide that committee with the faculty member’s curriculum vitae and the annual achievement report of the five prior years. The committee will report to the department head a recommendation of satisfactory or unsatisfactory performance relative to the BAEN expectations as described in Section 8.01a. These three peer review members will be voted by the faculty at the same time as the election of the Promotion and Tenure committee chair.
Although post-tenure review applies only to tenured faculty, this peer review process and group may be used for AgriLife Research and Extension faculty as well.

Any faculty member receiving an unsatisfactory rating will be reported to the dean and accompanied by a written plan for near-term improvement.

If a tenured faculty member receives three consecutive unsatisfactory annual reviews, a professional review will be initiated. The details of that review process will be followed as specified in University Rule 12.06.99.M1.

(c) Faculty Advisory Committee

The purpose of this committee is to foster leadership, to provide a sounding board for the head, and to provide a forum for discussing faculty issues with the head.

The committee will meet with the head at least 2 times per semester and at special meetings called by the head or members of the faculty advisory committee.

Membership of the committee includes the chairs of each of the standing committees (excluding the Scholarship Committee and the External Advisory Council), plus the associate heads.

(d) Engineering Undergraduate Program and Recruiting Committee

Review and evaluate undergraduate engineering curricula.

Prepare new and revised curriculum recommendations for consideration by the department faculty.

Prepare for ABET review.

Develop methods to enhance teaching excellence.

Prepare catalog materials.

Determine laboratory equipment needs.

Coordinate recruitment, retention, and placement of engineering undergraduate students.

Develop recruiting materials for engineering undergraduate programs, including brochures, videos, display material, etc.

Regularly review and recommend updates for departmental website.

Develop co-op and internship opportunities.

(e) AGSM Undergraduate Program and Recruiting Committee

Review and evaluate undergraduate agricultural systems management curriculum.

Prepare new and revised curriculum recommendations for consideration by the department faculty.

Develop methods to enhance teaching excellence.
- Prepare catalog materials.
- Determine laboratory equipment needs.
- Coordinate support courses for the College of Agriculture and Life Sciences.
- Coordinate recruitment, retention, and placement of AGSM undergraduate students.
- Develop recruiting materials for AGSM undergraduate programs, including brochures, videos, display material, etc.
- Regularly review and recommend updates for departmental website.
- Develop co-op and internship opportunities.

(f) Graduate Programs and Recruiting Committee

- Review and evaluate departmental graduate degree course offerings, policies and procedures.
- Develop recommendations for consideration by the department graduate faculty.
- Develop and implement graduate recruiting program, including brochures, videos, etc., to expand graduate student enrollment.
- Regularly review and recommend updates for departmental website.
- Formal review, evaluation, and recommendation of approval of graduate student admissions to degree programs within the department.
- Monitor graduate student progress.
- Prepare recommendations concerning honors and awards for graduate students.
- Update course description and content for catalog.
- Update the Biological and Agricultural Engineering Graduate Student Manual.
- Coordinate recruitment, retention, and placement of graduate students.
- Regularly review and recommend updates for departmental website.

(g) Infrastructure Committee

- This committee will provide strategic direction and operational support to departmental infrastructure and will work to expand development funding to assist our students and programs.
- Infrastructure includes building space, laboratories, computing facilities, and any other infrastructure needed to support departmental missions. This includes all buildings, computing equipment, website, and laboratory facilities.
(h) Development Coordination Committee

- Developmental funding will be for undergraduate scholarships, graduate student fellowships, enhanced technology, laboratory enhancement, and departmental excellence.

(i) International Programs

- Coordinate international experiences for BAEN undergraduate and graduate students, including the oversight of study-abroad programs and international exchanges

- Provide guidance to the department head on international activities of the faculty, including hosting of visiting students and scientists, potential collaborative agreements and other opportunities.

(j) Safety

- Coordinate safety programs for the department, including specifying necessary training for all employees, safety procedures to be followed in teaching and research laboratories, laboratory inspections and utilization of first aid equipment.

(j) Scholarship Committee

- Selects recipients for scholarships awarded by the department.

- Explore additional funding for scholarships.

- Prepare recommendations concerning honors and awards for undergraduate students.

- Document criteria used in selecting recipients.

- Ensure that scholarship recipients write thank-you notes to donors.

(k) Recognitions and Events Committee

- Coordinate and develop nominations for honors and awards for faculty, staff, and alumni.

- Encourage nomination of honors and awards among alumni and colleagues.

- Plan and coordinate social and recognitions events for department’s faculty and staff.

(l) Communications Committee

- Develop and maintain means of implementing the departmental Communications Plan.

- Most notably resume regular publication of the newsletter and maintain an updated departmental website.
Section 8.02  External Advisory Council

Name:

The name of this organization shall be the Biological & Agricultural Engineering Department External Advisory Council (BAEN-EAC).

Mission:

The missions of the BAEN-EAC are to:

- Foster stronger linkages and provide a continuing liaison between the academic community (faculty, staff, students), the practicing profession, and clientele.

- Assist the Department of Biological & Agricultural Engineering (herein referred to as the Department), College of Agriculture & Life Sciences, Dwight Look College of Engineering, and Texas A&M University in providing the highest quality of achievement in accomplishing the multiple missions of the land grant university system including teaching, research, and extension.

- Assist the Department in setting strategic direction to insure relevancy and impact of its programs.

The missions of the BAEN-EAC will be accomplished through the following functions:

- Review programs and goals of the Department. Typical areas to be reviewed follow.
  - Future challenges (state issues, new technologies, research initiatives, scope and direction for the Department, identification of collaboration, etc.).
  - Academic programs (educational needs, curriculum guidance, new directions, etc.).
  - Student professional development (student opportunities, mentorship, ethics, leadership development, etc.)
  - Research (clientele needs identification, priorities, collaboration, infrastructure, etc.)
  - Continuing education and professional development (identification of needs of professional engineers, curriculum development, delivery technologies, etc.).
  - Extension and outreach (strategic directions, initiatives and new programs, organization, communications, etc.).

- Advise the department head and the Department.

- Council members will have access to the department head both formally and informally through scheduled meetings and are strongly encouraged to provide suggestions and advice.

Membership:

- The Council shall consist of up to twelve voluntary members. Members shall be appointed by the Biological & Agricultural Engineering department head based on the suggestions by the Department faculty and the BAEN-EAC.

- Members shall serve a three-year term. Terms shall be staggered on an annual rotation such that approximately an equal number of new members are appointed each year. Members will be allowed no more than two consecutive terms.
Members shall be selected based on the following guidelines.

- Members shall be selected from those individuals whose business and/or professional careers have brought them recognition for sound judgment, decisive action, and high integrity.

- They shall have knowledge of and interest in the multiple missions of the land grant university system and a particular interest and concern for the development, advancement, and recognition of the Department.

- A diverse membership—taking into consideration programmatic areas, employment, and geographical areas—is desired.

Active participation is essential. Any member missing three meetings may be replaced at the discretion of the department head. In the event that a membership becomes vacant, the head of the Department shall appoint a new member prior to the next meeting.

Officers:

- The BAEN-EAC will elect a chair and a vice-chair.

- The executive committee will be comprised of the chair, the vice-chair, the department head, and the immediate past chair who will serve in an ex-officio capacity.

- Officers shall serve a one-year term and will be eligible for re-election.

- The chair shall preside over the meetings of the BAEN-EAC and provide leadership and guidance in the achievement of its goals.

- The vice-chair shall preside over the BAEN-EAC meetings in the absence of the chair and shall take primary responsibility for providing leadership and guidance to the committees and task forces established by the BAEN-EAC.

- The department head shall designate a Department member to serve as recording secretary of the BAEN-EAC. The recording secretary shall be responsible for maintaining minutes of the meetings as well as providing any other staff level support possible to increase the efficiency of the BAEN-EAC function.

Meetings:

- The BAEN-EAC will hold regular meetings. An effort will be made to schedule the BAEN-EAC meetings so members can interact with students at student club meetings or functions.

- Meetings will be called by the chair in consultation with the department head.

- Special BAEN-EAC meetings may be called by the chair or the head with sufficient notice.

- The agenda for each meeting will be established by the executive committee. Agenda items will be received from the faculty of the Department through the department head and from the members of the BAEN-EAC through the chair.

- A request for agenda items will go to the BAEN-EAC and the members of the Department at least one week prior to any scheduled meeting.

- An item may be added to the agenda at anytime up to or during a meeting at the discretion of the chair or the department head.
Committees:

- The chair shall appoint ad-hoc committees and task groups as required. Typically, committees will be appointed only for the duration of the requirement to be met.

Finance:

- Overhead expenses incurred by the officers of the BAEN-EAC in carrying out their responsibilities will be borne by the Department.

- BAEN-EAC members are individually responsible for personal lodging and travel expenses incurred in connection with BAEN-EAC activities.

Section 8.03 Other Committees

The head shall establish other standing and ad hoc committees as are necessary for the functioning and well being of the Department.

Article IX. APPOINTMENTS OF NEW FACULTY MEMBERS

Full Faculty: the head shall consult with the faculty advisory committee and members of the full faculty (as at a faculty meeting) prior to requesting new faculty appointments. If a new faculty position is approved, the head will appoint a search committee with advice from the faculty advisory committee. The search committee will review the position description, decide where to advertise, arrange for advertisements to be placed, and distribute the job description as appropriate. The search committee will review the applications and recommend to the head a short list of candidates for which reference letters should be requested. The search committee will review the reference letters and notify the head which candidates they would recommend for interviews. The head will make the final decision on candidates to interview and supervise the arrangement of interviews. All full faculty will be notified of the interview schedules and are expected to attend the seminar if possible. The search committee will solicit feedback from the faculty on all candidates. After the interviews, the search committee will provide a recommendation as to which of the interviewed candidates are acceptable. If a consensus cannot be reached, a vote should be taken and reported to the head. The search committee should list strengths and weaknesses of the finalists that they deem acceptable and submit to the head. The head will make the final decision on which candidate to make an offer. The promotion and tenure committee must vote on tenure if tenure is to be offered to a new appointment in the department.

Research Faculty: Research professors of all ranks are non-tenured and non-tenure track. They are expected to develop their own research programs that are independent of other faculty members, just like any full faculty member. However, collaboration with other faculty is encouraged. Candidates for a Research (Assistant, Associate or Full) Professor must present a seminar to the BAEN faculty. The BAEN faculty will be asked to provide input to the department head. A review of the candidate by the BAEN P&T Committee is not necessary, but it is expected that the candidate will meet the usual requirements as for full faculty for the rank (Assistant, Associate or Full) that they are being consider. The head will make the final decision on whether or not to hire the candidate.

Article X. SPACE

Space and facilities allocated to the department are for the use of all faculty to conduct university business and complete all our stated missions. The department head has the responsibility to allocate all departmental resources for the best benefit to the entire department. The department head will allocate all staff/faculty office and laboratory space. These spaces can only be occupied after receiving written approval from the department head. Graduate student office space will be allocated by the Graduate Programs Committee after consulting with the student’s major advisor. All requests for major facility modifications or re-allocations of space should be submitted to the Infrastructure and Development Committee for review. This committee should then forward their recommendation and discussion to the department head for a decision.
Office space generally designated as faculty office space will not usually be assigned to non-faculty unless they are on short-term appointments and excess space is expected to be available for the duration of that appointment. Visiting scholars, research/extension associates and post-docs will be given priority in these short-term assignments to faculty offices. They may be asked to move before their appointment is completed. Emeriti may be assigned space, depending on availability, if they have an active ongoing program that is beneficial to the department.

Laboratory space will generally be assigned to programmatic areas or as flexible labs, and will not be assigned for the exclusive use of individual faculty. Individual faculty may be assigned as coordinators of laboratory space and they will be responsible for ensuring that the space is fully utilized and available to all appropriate faculty. The laboratory coordinator will also be responsible for keeping the space safe and tidy. A flexible lab is space allocated for temporary projects. The project manager will be responsible for removing project equipment when the project is finished.

Computing hardware and software is maintained by the department to meet the stated missions. General use computing laboratories for graduate and undergraduate student use are supervised and maintained by the departmental computing support staff. Policy on the use of these facilities and the software provided is the responsibility of the Infrastructure and Development Committee. Individual computers in faculty offices are the responsibility of the faculty member. Each faculty member must ensure that all software has a legitimate license. Individual computers in staff offices are maintained by the computing support staff. Staff shall not install unauthorized software on those machines.

**Article XI. MODIFICATIONS TO THE PROCESS MANUAL**

Editorial changes can be made with the approval of the head. All substantive changes require a 3-step process. First, the faculty advisory committee must submit a written request of the proposed changes to the head and, second, the head must approve the changes. Third, the proposed changes must receive a majority vote from the faculty that reply to an oral, written or electronic vote request.

For related University rules, refer to: [http://rules.tamu.edu](http://rules.tamu.edu).

**Article XII. ADDITIONAL PROCEDURES**

As departmental policies are established, they may be added to this Article as a means of making them widely available to all departmental personnel. Policies approved by the faculty by vote (oral, written or electronic) may be added to this Article without following the Article XI procedures for modifying the process manual.
Departmental Building Key Issuance Deposit and Deposit Return Procedures

1. Keys will be issued by the departmental designated staff member (key manager) responsible for keys.
2. Replacement keys will be ordered from Physical Plant Key Control by the key manager.
3. To issue keys, requirements are as follows:
   A. Room number
   B. Supervisor Authorization
   C. Deposit
4. The key manager will prepare “Key Information Card” for each key holder and file alphabetically in file held in locked key cabinet.
5. Deposits will be charged as follows:

**Scoates Hall and P&M Building**
1-2 keys deposit = $5.00
3-above keys deposit = $15.00

**Hobgood, West Campus Compound Gate, West Campus Shop**
1-2 keys deposit = $10.00
3-above keys deposit = $20.00

Key Replacement Costs as of 04-06-11:
Scoates = $2.00
P&M= $2.00
Shop= $2.00
Gate= $5.00
Hobgood= $5.00

6. Deposits will go to Business Associate I to Log into “Receipts Log”
7. Cash will be routed to Business Coordinator I to prepare deposit for account 06-203016-09203. Deposits will be delivered to the Fiscal office.
8. Deposits will be reconciled with cash log to FAMIS account by Business Administrator.
9. Key deposit list will be kept by Business Associate I and will be reconciled with FAMIS and Key Cards monthly then submitted to supervisor for approval.
10. Upon key user termination, key cards will be forwarded to payroll personnel conducting exit review for employee. Person conducting exit interview must sign and date key card. As keys are returned, key card will be noted and forwarded to Business Assistant III to prepare purchase voucher for deposit reimbursement. All returned keys are given to key manager to hang in key cabinet.
11. In case keys are lost or not returned, the deposit will be kept upon termination to replace the key/keys.
12. If employee terminates without returning keys, a 6 month waiting period will be triggered, during which the employee can return the keys and request the deposit return. After six months, the deposit will be transferred to 06-203016-09204 holding account.

Policy initiated April 11, 2011
Departmental Color Printing Policy

Problem: Payment for the number of color pages printed beyond the contract allowance more than doubles the cost of the copier each quarter. The department has been paying the full printing costs, but recent budget reductions no longer allow that practice.

Details: The contract for the Xerox copier allows for 15000 black/white and 750 copies per quarter. Excess black/white copies cost $0.0066/page and color copies cost $0.09/page. We never reach the B/W limit but always dramatically exceed the color allowance. The average quarterly number of copies during FY11 was 9129. The majority of this usage was from about 20% of the accounts.

Actions to be taken:

1. Access to color printing will not be limited, but heavy users will be asked to cover a portion of their cost.
2. The department will continue to cover the cost of up to 300 color pages per account per quarter. Color pages printed beyond 300 will be charged to the user at the contract rate ($0.09/page).
3. The Xerox printer will be set to default to black/white printing. To obtain color, the user will have to select color in the print job set up window. This is intended to minimize unintended color printing.

Policy effective date: September 16, 2011
**Departmental Inventory Procedures AgriLife Research/Extension**

For new items:

- You will be given a tag for your equipment from Business Assistant III when the item has been delivered and she will process the voucher for payment.
- You are to affix the tag on your asset in a place that is easily accessible to an auditor.
- Sign and return the form stating you have put the label on the equipment and all the information is correct to Business Coordinator I within 5 business days. (This will begin the “file” for your asset.) If the item description needs to be changed to insure that it is accurately and clearly described, make changes on the form before returning it.
- Any changes in location must be submitted to margob@tamu.edu with the new location within five business days of a location change. (Note: This includes changing rooms within a building.)
- Any transfers made into the department or between faculty members within the department will require a signature or email confirmation from the faculty member accepting the item. Anyone inheriting an item from a former faculty member will be asked to accept the items before they are listed on that individual’s inventory. Assets should not be assigned to you without your knowledge.
- Upon leaving employment, you will do a termination checklist with Business Administrator. At that time, you should decide what your plans are for your inventory and give that information to Business Coordinator I. If you are giving it to another faculty, we need confirmation from them stating they accept the item.
- Remember, you are responsible for the items assigned to you. Please secure them properly.

For Disposal of Obsolete or Unused Items:

These steps will be followed in disposing of unwanted inventory items.

1. Email Business Coordinator I margob@tamu.edu to request that an item be removed from your inventory. In your email, include the full asset number and description of the item. State in your email whether the item is in working condition or not. This email will be forwarded to BAEN faculty, staff, and graduate students asking if anyone else has a need for your item.
2. Items can be removed from inventory by “dropping”, sending to Surplus Property or by sale on the Lone Star auction web site. The most appropriate means will be determined by business and departmental support staff.
   a. “Dropping” an item means it is broken beyond repair and will not be sent to Surplus.
   b. Sending to Surplus Property requires that the proper paperwork be filled out and approval obtained before the item is taken to Surplus Property.
   c. Items can be sold via Internet auction. Appropriateness of items for the auction will be determined by a staff member designated by the Department Head to handle auction items.
3. Disposal of computers that are not claimed by others – Desk top computers should have any hard drives removed so that the computer chassis and hard drive(s) are separate items. Laptops do not have to have the hard drive removed. That task will be done by inventory staff.
4. If someone wants to claim an item that is to be disposed, that request should be made by or through a faculty member within one week of the forwarded disposal request. While some staff are assigned inventory, no inventory items will be assigned to graduate students. The faculty member will need to accept the item(s) on their inventory.
5. For items that are not claimed, Business Coordinator I will complete the online transfer and obtain all necessary approvals. (Approvals should take no more than 2 days.) The disposal forms will be given to the owner of the item, and that person is responsible for delivering the item and the paperwork.
6. Items that are designated for disposal will be collected and stored in secured areas prior to transfer to Surplus Property. There will be one locked area in Scoates Hall and one at West Campus. Items for disposal will be accepted by a staff member (currently Technical Laboratory Coordinator or Senior Systems Administrator). Those items will only be accepted in person and only if they are accompanied by the disposal paperwork from Business Coordinator I. Items will be accumulated in storage for periodic trips to Surplus Property. Technical Laboratory Coordinator has responsibility for transferring inventory items to Surplus Property at an appropriate frequency. Each item stored must have the disposal paperwork attached to it. **Do not drop items outside of offices or storage spaces without someone accepting them.**

   **Responsibility for the item remains with the original owner until accepted by the staff member.**

   Once accepted and stored by a staff member, the item will remain on the inventory list until accepted at Surplus Property.

7. Technical Laboratory Coordinator has been assigned responsibility to determine appropriateness for and management of sales on the Lone Star auction site. He has authority to determine if an item will be sold at auction or taken to Surplus Property. Any funds gained through the auction of surplus items will go into a departmental operating account to support the shop, vehicles, etc. For items with significant value (> $5000 selling price), the proceeds will be split equally between the department and the inventory owner. Receipts will be created for any items sold.

8. Items not auctioned will go to Surplus Property. When Technical Laboratory Coordinator takes items to Surplus Property, he will receive receipts for all items accepted. Primary responsibility for taking items to Surplus is Technical Laboratory Coordinator’s, but others can take items, if coordinated with him. All procedures must be followed in obtaining receipts.

9. The receipt for items transferred should be given to Business Coordinator I. One copy will stay on file in the department and the item owner will be given a copy for their records. **This receipt is the only proof that your item made it to Surplus, and will be removed from your inventory. Keep it with your inventory lists.**

10. Property will mail a formal Deletion Certification to the department for our files. We will refer to this document if questions appear on your inventory next year.

QUESTIONS?

BAEN Departmental Contact  
Business Coordinator I – Inventory Manager  
margob@tamu.edu  
862-7416  
*Prepares inventory forms*

Surplus  
Bubba Bommski, Surplus Manager  
845-3427

AGENCY CONTACTS:

Texas AgriLife Research/Extension (06/07)  
Procedures can be found at: [http://agrilifeas.tamu.edu/library/pdf/inventory/procedures.pdf](http://agrilifeas.tamu.edu/library/pdf/inventory/procedures.pdf)

Cyndie Michalak, Property Manager  
ca-michalak@tamu.edu  
845-4791  
*Manager for all aspects of inventory for AgriLife And Texas Veterinary Medical Diagnostic Laboratory.*

Shari Jarratt, Financial Assistant  
sjarratt@ag.tamu.edu  
845-6471  
*Approves preliminary fixed assets and audits certifications for Texas AgriLife Extension Service.*

Sharon Gillespie, Financial Specialist III
Approves preliminary fixed assets, audits transfers, Deletions, etc., reconciles accounts, audits certifications for Texas AgriLife Research, Texas AgriLife Extension Service, and Texas Veterinary Medical Diagnostic Laboratory

Texas A&M University (02)
Procedures can be found at: http://finance.tamu.edu/fmo/pm/default.asp

Todd Gregory, Property Manager
tlgregory@tamu.edu
845-8147
Backup for bar code equipment and training, inventory barcode labels, inventory certifications.

Carolyn Stapp
carolyn-stapp@tamu.edu
845-9436
Inventory barcode label, inventory certifications, inventory transfers, backup: inventory deletions.

Texas Engineering Experiment Station (08)
Procedures can be found at: EPIK Portal – Business Office access only

Doug Stark, Property Manager
dstark@tamu.edu
458-7437

Tiphany Bode
tiphany@tamu.edu
458-7642
Departmental Safety Policy

Departmental Adhoc Committee on Safety – Recommendations
Participants: Elena Castell-Perez; Richard Epting; San Fernando; Ron Lacey and Zivko Nikolov

1. Safety Courses:
   a. Courses available pertinent to different constituents of the BAEN Department are as follows:
      i. Introduction to Laboratory Safety (classroom) offered by TAMU Environmental Health and Safety Office. Registration Link: https://rammgt.tamu.edu/ehsawebisapi.dll/EXEC
         This training is required for all TAMU personnel (including graduate students on assistantships) who are laboratory employees. For more information contact Nancy Eaker (5-5332).
      ii. Lab Safety Training (online) offered by Office of Engineering Safety (https://labsafety.tamu.edu/training/labsafety/default.asp)
      iii. Shop and Tool Safety Training (https://labsafety.tamu.edu/training/shopsafety/default.asp)
      iv. Other online and classroom training programs covering a broad range of topics including Fire Safety, Respiratory Protection, Radiation Safety etc. are available at http://ehsd.tamu.edu/Training.aspx
      v. TAMU Safety Manual contains comprehensive information on topics pertinent to BAEN (such as General Safety, Laboratory Safety, Shop Safety, Electrical Safety, Biological Safety, Chemical Safety, Radiation Safety, Agricultural Safety and Vehicle Safety). This could be a good resource to be made available for those engaged in specific activities.

2. Policies
   a. Departmental personnel need to take appropriate safety training as identified below on a bi-annual basis:

<table>
<thead>
<tr>
<th>Type of Personnel</th>
<th>Laboratory Safety (online version)</th>
<th>Shop and Tool Safety</th>
<th>Specific Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty</td>
<td>✓</td>
<td>✓ (as required)</td>
<td>✓ (as required)</td>
</tr>
<tr>
<td>Staff (administrative)</td>
<td></td>
<td></td>
<td>✓ (as required)</td>
</tr>
<tr>
<td>Staff (Technical, Teaching and Extension)</td>
<td>✓</td>
<td>✓ (as required)</td>
<td>✓ (as required)</td>
</tr>
<tr>
<td>Laboratory employees (including grad./undergrad. students)</td>
<td>✓</td>
<td>✓ (as required)</td>
<td>✓ (as required)</td>
</tr>
<tr>
<td>Shop employees</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>✓</td>
<td></td>
<td>✓ (as required)</td>
</tr>
<tr>
<td>BAEN Undergraduates *(in BAEN 301)</td>
<td>*(in BAEN 301)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGSM Undergraduates *(in AGSM 360)</td>
<td>*(in AGSM 360)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The immediate supervisor will be responsible in determining the training requirements
*The curriculum committees to decide on whether such a blanket course requirement is necessary and if so, how it will be implemented.

b. Machine Shops: When operating machinery with moving parts, at least one person in addition to the operator should be present in the vicinity.

c. In laboratories, the laboratory proctors (or Principle Investigators) are responsible in identifying experiments/activities that carry substantial risk (chemical, mechanical, fire etc). These activities should be carried out only when an additional person is present especially during afterhours (between 5.00PM to 8.00AM). Personnel carrying out such activities during afterhours should get prior approval from the laboratory proctor/PI.

d. When an activity is ongoing in a laboratory, safety gear (goggles, masks, gloves etc as required) should be worn by responsible parties at all times. It is the PI’s responsibility to enforce safe laboratory practices.

3. Safety Issues Identified and Recommendations

a. None of the departmental buildings (Scoates, Hobgood and P&M) have heart defibrillators and these units need to be installed. It is proposed to have a unit each in Scoates, Hobgood and P&M buildings.

b. No trained personnel in first aid and/or defibrillation are present in any of the BAEN buildings. It is recommended to identify at least two personnel for Scoates and two for Hobgood/P&M to be trained in first aid.

c. It is recommended to form a permanent “Safety Committee” (stand-alone or as a part of the infrastructure committee) to help ensure safe practices are adopted. This committee will be responsible for performing annual laboratory walkthroughs and filling out “Lab Inspection Checklists” for individual labs.

d. More signage is needed near equipment/locations where potential risks are present. Also, signs should be posted in appropriate locations (E.G. machine shops) stating that personnel who do not have appropriate training are not allowed to use the facility(ies).

### Suggested Courses for Specific Safety Hazards Identified Pertinent to Research/Teaching/Extension Activities of BAEN Department

<table>
<thead>
<tr>
<th>Hazards</th>
<th>Suggested Safety Training Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>General work safety</td>
<td>Classroom</td>
</tr>
<tr>
<td></td>
<td>• Hazard communication</td>
</tr>
<tr>
<td></td>
<td>(<a href="http://ehsd.tamu.edu/Training.aspx">http://ehsd.tamu.edu/Training.aspx</a>)</td>
</tr>
<tr>
<td></td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>• Safety for Office and General Work Areas (via TrainTraq)</td>
</tr>
<tr>
<td>Shop Operations</td>
<td>Online:</td>
</tr>
<tr>
<td>Electrical</td>
<td>• Shop and Tool Safety Training</td>
</tr>
<tr>
<td>Mechanical</td>
<td>(<a href="https://labsafety.tamu.edu/training/shopsafety/default.asp">https://labsafety.tamu.edu/training/shopsafety/default.asp</a>)</td>
</tr>
<tr>
<td>Chemical</td>
<td>• Also available via TrainTraq</td>
</tr>
<tr>
<td>Chemical Laboratory Safety</td>
<td>Classroom:</td>
</tr>
<tr>
<td></td>
<td>• Introduction to Laboratory Safety offered by TAMU Environmental Health and Safety Office.</td>
</tr>
<tr>
<td></td>
<td>(<a href="http://ehsd.tamu.edu/Training.aspx">http://ehsd.tamu.edu/Training.aspx</a>)</td>
</tr>
<tr>
<td></td>
<td>Online:</td>
</tr>
<tr>
<td></td>
<td>• Lab Safety offered by Office of Engineering Safety</td>
</tr>
<tr>
<td></td>
<td>(<a href="https://labsafety.tamu.edu/training/labsafety/default.asp">https://labsafety.tamu.edu/training/labsafety/default.asp</a>)</td>
</tr>
<tr>
<td>Topic</td>
<td>Training Options</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Radiological                               | **Classroom:**
|                                            | - General Radiation Safety Training – New Users (Open Isotope and Sealed Source) |
|                                            | **Online:**
|                                            | - General Radiological Safety Refresher Training (Open Isotope and Sealed Source); Also available via TrainTraq |
|                                            | - Laser Safety Training                                                          |
|                                            | - X-ray Devices: Radiation Safety Training (XRD, XRF, cabinet x-ray, research)    |
| Biohazards (maybe different levels depending on the organisms handled) | **Online:**
|                                            | - NIH Guidelines for Principal Investigators                                       |
|                                            | - Biosafety Level 2 Annual Training                                               |
|                                            | - Biosafety Level 3 Annual Training                                               |
|                                            | - Bloodborne Pathogen Training                                                    |
|                                            | - Training related to specific biohazard(s) are available in TrainTraq             |
| Agricultural equipment operation           | **Online:**
| Tractor Safety (John Deere)                | - via Traintraq                                                                  |
| ATV General Safety                         | - Utility Vehicle Safety Program (self study)                                    |
| Riding Lawn Equipment                      |                                                                                                                                 |
| Equipment training for use of BAEN shop tools (anyone who wants to use our tools, to be given by Richard) | Epting shop tool training                                                      |
| Field Research                             | **Online:**
| Agricultural Pesticides                    | - via TrainTraq                                                                  |
| Operation of generators as a remote power source |                                                                                                                                 |
| Fire                                       | **Classroom:**
|                                            | - Fire Extinguisher Training ([http://ehsd.tamu.edu/Training.aspx](http://ehsd.tamu.edu/Training.aspx)) |
|                                            | **Online:**
|                                            | - Fire and Life Safety (via TrainTraq)                                            |
| Food Safety                                | TBD                                                                              |
| Other Hazards (to be identified)           | TBD                                                                              |
Communications Plan for the
Biological and Agricultural Engineering Department

Communications Objectives:

The biological and Agricultural Engineering Department (BAEN) has several faculty, staff, associates, visiting scholars, friends, students, peers, and administrators, who are scattered around campus the State and the world. BAEN needs effective and targeted communications among all of these groups to meet a variety of goals. This communications plan will help us implement strategies for communications which have largely been overlooked in the past.

Specifically, our objectives are to:

- Enhance communications among faculty members.
- Enhance communications between department head and faculty/staff.
- Increase communications between department and college (COALS and COE)/agency (AgriLife Research/Extension, TEES) administrators.
- Increase communications between department and external friends of department.
- Increase communications between department and potential students on and off campus.
- Increase communications between department and current students.
- Increase communications between department and peer departments – on-campus, domestic and international.

Among Faculty Members:

Faculty members:

- Need to know what other faculty are doing in their research, teaching and extension programs.
- Need recognition for their achievements from their peers.
- Need an appreciation of what their peers contribute to the department.
- Need to have a sense of pride and belonging regarding their department.

Between Department Head and Faculty/Staff:

The Department Head needs to:

- Make faculty/staff aware of important events and happenings in the department.
- Motivate them to take specific actions.
- Inform them of decisions that affect several people.
- Establish a collegial work atmosphere.

Between Department and Administrators:

The Department needs to:

- Make administrators aware of our accomplishments, success stories, and relevance.
- Make administrators aware of problems and how to help us.
- Communicate goals and directions.
Between Department and External Friends:
The Department needs to:

- Maintain contact with former students, industries and commodity groups who may wish to help us financially and provide guidance in goal setting.
- Make external friends aware of our accomplishments, success stories and relevance.
- Make potential employers aware of our quality students.

Between Department and Potential Students:
The Department needs to:

- Make potential students aware of our degree programs.
- Make students aware of the exciting career opportunities once they receive their degrees.
- Increase number of students overall and especially students from under-represented groups.

Between Department and Current Students:
The Department needs to:

- Make students aware of all emphasis areas and help them make choices in classes and direction.
- Retain students by continually informing them about our discipline.
- Motivate students to be involved in student organizations, internships, and international experiences.

Between Department and Peer Departments:
The Department needs to:

- Make peer departments (on and off campus) aware of our excellent research, teaching and extension programs to maintain high national rankings.
- Make peer departments want to collaborate with us.
- Make peer departments want to recommend their graduate students to us.
- Make potential faculty want to work with us.

Delivery Vehicles and Timeframes:

- Newsletter – 6/yr [Send to faculty, staff, graduate students, undergraduate students, administrators, external friends of department, external advisory committees, Texas Section of ASABE, past donors and targeted potential donors]
- Department Web Site – revised once per year; updates as needed.
- Faculty meetings – 6/yr (3/semester)
- Faculty/staff evaluations – 1/yr
- Faculty/staff socials – 12/yr
- Faculty/graduate student seminars – 12/yr
- Various committee meetings – minimum 2 times/yr per committee
- Faculty/student socials – 4/yr
- Student Awards Banquet – 1/yr
- Written degree promotion pamphlets – 1/3 years
- Articulation agreements, MOUs with peer departments/other institutions – as appropriate
- Faculty visits to external departments/institutions – as opportunities arise
- Departmental review with administrators – 1/yr
- External Advisory Committee to Department – 2/yr
- Email notices and communications – as needed
- One-on-one meetings – as needed
BAEN Communications Plan Matrix:

*From Whom:*

1. BAEN Department
2. Department Head
3. Faculty

*To Whom:*

1. Faculty
2. Staff
3. Administrators
4. External Friends
5. Potential Students
6. Current Students
7. Peer Departments

*Delivery Method:*

1. Newsletter
2. BAEN Web Site
3. Faculty Meetings
4. Faculty Evaluations
5. Staff Evaluations
6. Faculty/Staff Socials
7. Seminars
8. BAEN Committee Meetings
9. Faculty/Student Socials
10. Student Awards Banquet
11. Promotion Pamphlets
12. Articulation agreements, MOUs
13. Faculty visits
14. Annual departmental review with Administrators
15. BAEN External Advisory Council
16. Emails
17. One-on-one visits
<table>
<thead>
<tr>
<th>Whom</th>
<th>From Whom</th>
<th>To Whom</th>
<th>Delivery Method</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>General News</td>
<td>1-3</td>
<td>1-7</td>
<td>1,2,3,16,17</td>
<td>6/yr</td>
</tr>
<tr>
<td>Individual Faculty News</td>
<td>3</td>
<td>1-7</td>
<td>1,3</td>
<td>6/yr</td>
</tr>
<tr>
<td>Departmental News</td>
<td>1-4</td>
<td>1-7</td>
<td>1-3,6,10-11,13-17</td>
<td>6/yr</td>
</tr>
<tr>
<td>Motivation to Action</td>
<td>2</td>
<td>1-7</td>
<td>1-17</td>
<td>As need</td>
</tr>
<tr>
<td>Collegial Work Atmosphere</td>
<td>2-3</td>
<td>1-3,6</td>
<td>1,3,6,7,9,10,16,17</td>
<td>6/yr</td>
</tr>
<tr>
<td>Address Challenges to Department</td>
<td>2</td>
<td>1-3</td>
<td>3,4,5,7,14,15,16,17</td>
<td>As need</td>
</tr>
<tr>
<td>Establish Goals and Directions</td>
<td>2</td>
<td>1-4</td>
<td>3,8,14,16,17</td>
<td>As need</td>
</tr>
<tr>
<td>Market Students to Employers</td>
<td>1-3</td>
<td>4,7</td>
<td>1,2,15,16</td>
<td>6/yr</td>
</tr>
<tr>
<td>Recruit Students</td>
<td>1-3</td>
<td>5</td>
<td>2,11-13,15,16</td>
<td>2/yr</td>
</tr>
<tr>
<td>Recruit Faculty</td>
<td>1-3</td>
<td>7</td>
<td>1,2,13</td>
<td>6/yr</td>
</tr>
<tr>
<td>Maintain High National Rankings</td>
<td>1-3</td>
<td>7</td>
<td>1,2,12,13,16</td>
<td>6/yr</td>
</tr>
<tr>
<td>Peer Collaboration Opportunities</td>
<td>1-3</td>
<td>7</td>
<td>1,2,12,13,16</td>
<td>6/yr</td>
</tr>
<tr>
<td>Inform Current Students</td>
<td>1-3</td>
<td>6</td>
<td>1,2,11,16,17</td>
<td>6/yr</td>
</tr>
</tbody>
</table>