Self-Study Report
Industrial & Systems Engineering Program
Bachelor of Industrial & Systems Engineering
Auburn University

2010

BACKGROUND INFORMATION

Program History

The Department of Industrial and Systems Engineering (ISE) has been granting undergraduate degrees continuously since 1932. This makes our department one of the oldest in the Southeast. There are over 4,000 living alumni of the department. While the degree name has changed slightly over the years (industrial engineering to industrial management, and now, to industrial and systems engineering) the core mission of excellence in producing industrial engineers has remained. The program is ranked in the top 25% nationally, and is the highest ranked engineering program at AU (latest U.S. News). Results from the College of Engineering alumni survey conducted in 2009 for 2000-2008 graduates show that the industrial engineering graduates of our program (33 respondents) are more satisfied overall (97%) with their educational experience than those in any other program in the College.

Notable alumni of the department include Joe Forehand, retired CEO of Accenture, George Hairston, retired CEO of Southern Nuclear, Susan Story, CEO of Gulf Power, Tim Cook, COO of Apple Computer and Larry Davis, retired General, U.S. Army Corps of Engineers. In the fall of 2009 there were 206 undergraduate students enrolled in the department, a 60% increase since the fall of 2004. Of the undergraduate students 33% are female and 17% are African American (our predominant minority group). Most undergraduate students come from Alabama, Georgia, Tennessee, Florida and Texas, however many other states and a few foreign countries are represented. Nearly all undergraduate students are full time students of a traditional age (18 to 23). Some work part time during school terms. Over the past six years, student participation in co-op or internship positions has increased from approximately 25% to approximately 40%.

In December 2007, the Department of Industrial and Systems Engineering moved to the Shelby Center for Engineering and Technology, a new state-of-the-art building. The ISE computer lab and computer teaching classroom are furnished with more than 70 new
computers. Conference rooms, two labs and the teaching labs are equipped with “Smart Boards”, and sixty “Senteo” units were purchased to allow students to respond electronically during class. The faculty has been trained on the use of the new equipment and makes extensive use of the expanded technology to enhance the learning environment for students. ISE is in the same building complex as Engineering Administration and Computer Science and Computer Engineering which increases opportunities for interactions and collaboration of students, faculty and staff.

Several fairly minor curriculum changes have been implemented since ABET’s last visit in 2004. A “Curriculum Change Log” is kept by the department that documents all curriculum changes. A copy of the log is shown in Appendix E. These are the changes: One semester credit hour was added to INSY 3021 (Methods and Work Measurement), making it a 3-semester hour course instead of a 2-semester hour course. Consequently, the program’s total semester hours increased from 125 to 126 hours. MATL 2100 (Introduction to Material Science) replaced ENGR 2100 (Mechanics) in the curriculum to better prepare students for INSY 3800 (Manufacturing Processes). Finally, one of the two required computer courses in the curriculum has been changed. First, in Spring 2006, COMP 3000 (C++) was replaced with COMP 1210 (Java), and then in Fall 2008, a new course, COMP 3010 (Spreadsheet based Applications with Visual Basic) replaced COMP 1210. The new course was developed by two ISE professors along with a computer science professor to better equip ISE students for working in a real-world engineering setting. It is taught by the computer science faculty and includes a lab whereas the prior courses did not. There were a few changes made to the ENGR and TECH electives to keep them current and aligned with the aforementioned curriculum changes.

In response to the growth of the automotive industry in Alabama, ISE and ME (Mechanical Engineering) began offering classes toward a minor in “Automotive Engineering and Manufacturing” in Fall 2008. The first ISE student with this minor graduated in May 2010. In addition to this curriculum addition, Research Experience for Undergraduates (REU), a summer program that was funded by the National Science Foundation (NSF) for summers 2007-2009, provided undergraduate students from around the country with research opportunities. The focus of the program was automotive research with a vision of building an Automotive Manufacturing Research Center focused on manufacturing and technology for the next generation vehicles.

In conjunction with the REU program during the summer of 2009 two Auburn ISE students participated in a student exchange program with one of AU’s partner universities, Pukyong National University (PKU) in Busan, South Korea. Three industrial engineering students from PKU attended the last four weeks of the summer 2009 REU program at Auburn while two ISE Auburn undergraduates went to a multinational four week exchange program at PKU.

The faculty is currently at the same number as at the last 2004 accreditation visit, although some of the people have changed. Changes include three retirements, one who left to take a position elsewhere, several new assistant professors, and several new part-
time instructors. There have also been some faculty promotions during the intervening years.

**Options**

*List and describe any options, tracks, concentrations, etc. included in the program.*

There are no options, tracks, or formal concentrations in the program. All students in the program receive the same BISE degree. However, students are able to choose three electives (two INSY and one TECH, or three INSY). Approximately 34% of ISE students pursue minors. AU requires that minors are 15 semester hours minimum above and beyond courses required for the degree. The most popular minor by far is the Business Minor, comprising 71% of the minors obtained by ISE students. Students also pursue minors in many other areas, such as Automotive Manufacturing and Engineering (the new minor), Business Engineering Technology (B-E-T), foreign languages, supply chain, philosophy, psychology, etc.

**Organizational Structure**

*Use text and/or organization charts to describe the administrative structure of the program from the program to the department, college, and upper administration of your institution, as appropriate.*

The ISE department has a program chair, Dr. Alice Smith, who has been the chair since 1999. She reports to the Dean of the College of Engineering, Dr. Larry Benefield, who has been Dean since 2000. The time of both of these individuals in these positions has lent great stability to the Department. The organizational structure of AU from the president to the department is shown in Figure B.1.
**Program Delivery Modes**

*Describe the delivery modes used by this program, e.g., days, evenings, weekends, cooperative education, traditional lecture/laboratory, off-campus, distance education, web-based, etc.*

The program is offered to full time students on campus primarily during the day. A few of the labs for required classes may last as late as 7:45 p.m. Classes include traditional lectures and laboratories as appropriate. A co-op program is available, but no course credit is given for co-op experience. One of the required courses in the program, COMP 3010 (Spreadsheet Applications with VBA), has recently been offered as a “distance education” course by the Computer Science department. This enables ISE students who are on co-op or internship to take this course while being away from Auburn.
CRITERION 1. STUDENTS
A. Student Admissions

Summarize the requirements and process for admission of students to the program.

Admittance to Auburn University at the undergraduate level is done by the institution; the department has no involvement with the admissions process. Students are admitted to the college that they choose. Since the requirements for engineering education necessitate high school preparatory work of high intellectual quality and of considerable breadth, the following program is recommended by AU as minimum preparation for those students planning to pursue an engineering degree:

- English – four years
- Mathematics – four years, including Algebra II, Geometry, Trigonometry and Analytical Geometry
- Science – two years, including Chemistry. Physics is recommended but not required.
- Social Studies – three years
- Foreign languages are recommended, but not required.

Students who ultimately become ISE majors may enter as pre-ISE (termed PIE in the university computer system), as undeclared engineering majors (termed PN in the system), or as any other major (but typically as another pre-engineering major). Most students have declared as BISE majors by the middle of sophomore year, although some do change their minds later. Table 1.1 below shows the standardized test score and high school rank data for incoming engineering students at AU for the last five years.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Composite ACT MIN</th>
<th>AVG</th>
<th>Composite SAT MIN</th>
<th>AVG</th>
<th>Percentile Rank in High School MIN.</th>
<th>AVG.</th>
<th>Number of New Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-10</td>
<td>17</td>
<td>27.8</td>
<td>940</td>
<td>1266</td>
<td>22%</td>
<td>81%</td>
<td>890</td>
</tr>
<tr>
<td>2008-09</td>
<td>18</td>
<td>27.1</td>
<td>790</td>
<td>1236</td>
<td>20%</td>
<td>79%</td>
<td>841</td>
</tr>
<tr>
<td>2007-08</td>
<td>16</td>
<td>26.3</td>
<td>800</td>
<td>1198</td>
<td>7%</td>
<td>79%</td>
<td>770</td>
</tr>
<tr>
<td>2006-07</td>
<td>16</td>
<td>25.4</td>
<td>790</td>
<td>1199</td>
<td>10%</td>
<td>78%</td>
<td>712</td>
</tr>
<tr>
<td>2005-06</td>
<td>16</td>
<td>25.5</td>
<td>900</td>
<td>1194</td>
<td>12%</td>
<td>77%</td>
<td>692</td>
</tr>
</tbody>
</table>

Table 1.1 History of Admissions Standards for Freshmen Admissions for Past Five Years

Our data from the last six years tells us that approximately 13% of our undergraduate students transferred from other institutions. Approximately 52% transferred from other majors. The majority come from Mechanical Engineering (20%), Computer Science and related programs (20%), Electrical Engineering (12%), and Chemical Engineering (12%).
We have seen an increase of about 50% over the past six years in the number of students who come in as pre-ISE majors. We believe this is largely due to our increased recruiting efforts at events including E-Day and Talons, which are geared toward high and middle school students.

The process for a student to transfer into our program is simple. If a student wants to transfer into our program and they are eligible to be in the College of Engineering (at least 2.2 overall GPA), we welcome them. The student visits Engineering Student Services and requests to change to or declare the ISE major. The student then meets with our departmental academic advisor. This can take place anytime during the year, although most students change majors around the registration periods of March and October. When transfer students meet with the advisor, a realistic graduation date is determined, and the student is advised on which courses to take for the upcoming semester. Co-ops and internships, if applicable, are taken into account at this time. The student is added to the department’s undergraduate email list serve so that future communications can be made by the department. (Email is the official form of communication within Auburn University.)

B. Evaluating Student Performance

Summarize the process by which student performance is evaluated and student progress is monitored.

Student performance is evaluated through metrics defined by each course in which they are enrolled. Academic performance and progress are reviewed and discussed during the required academic advising periods at least twice each year. The College of Engineering places an “advisor hold” on each student which prevents the student from registering for classes for the next semester until he/she is cleared by an academic advisor. Ad hoc advising and monitoring occur at other times such as when a student experiences academic difficulty or personal problems, wants to add a minor or co-op, or changes majors (into ISE). We work closely with Engineering Student Services, who maintain all official undergraduate engineering student records, in all aspects of advising and monitoring.

The College of Engineering sets the requirements for students to move from PIE to INSY (the institution’s designation for students obtaining a BISE degree). A student must have successfully completed:

- two semesters of calculus
- two semesters of lab science (normally physics, but may combine one physics and one chemistry)
- one intro to computing class (COMP 1200)
- ENGR 1100
- ENGR 1110
- Student must achieve sophomore standing (31 hours)

Students are dismissed if they do not meet the requirements before junior standing (61 hours, typically four semesters) except under unusual circumstances.
Pre-requisites (pre-reqs) for ISE courses are strictly enforced. The Banner system prevents students from registering for courses for which they do not have the pre-reqs. If a student fails a course, and is already pre-enrolled in a course in a future semester that requires the failed course as a pre-req, the student is dropped from the future course manually by the advisors in Engineering Student Services or the ISE advisor.

Co-op students are also advised through the university co-op office. Students choose from among three model rotations depending on which term that they begin co-op work. Then, the department works with the student to develop a customized schedule to accommodate co-op. Co-op is three terms (normally with the same employer) for which the student does not receive course credit.

C. Advising Students

Summarize the process by which students are advised regarding curricular and career matters.

All Industrial Engineering undergraduate students are individually advised by one professional departmental advisor and must be advised before registering for classes. Students can also be advised by the department chair as an alternative. An "advisor hold" prevents a student from registering without being advised. The hold is in the form of a new 6-digit random PIN number that is assigned to every student by the college at the beginning of the semester. The PIN number is required to enter the registration area in “Tiger I”, which is part of the Banner system. After the student is advised, the PIN number is changed to “111111” and the student is able to register when their time ticket (see definition below) is opened.

The advising periods for currently enrolled students are in September/October for spring semester and in February/March for summer and fall semesters. Incoming freshmen are advised at Camp War Eagle (freshmen orientation) during the summer. Students are issued a “time ticket” (date and time at which a student can begin registration) by Banner based on their priority and number of hours completed. Priority is given to students in the Honors College, those who co-op, those in ROTC, etc. The priority policy is an institution-wide one. Advising is done before students’ time tickets open.

An email (See Appendix F) is sent through the department list serve (undergraduate students are required to be part of the list serve) announcing that advising is beginning. This occurs approximately a week before the advising period begins. Students may sign up for a 20 minute appointment with the advisor in an appointment book. Students needing extra time may sign up for two consecutive appointments. Students who are off campus (co-oping, studying abroad, etc.) are advised by email or phone. An Excel spreadsheet is created for each student (see Appendix F) and is updated every semester. The spreadsheet shows which courses in the curriculum that the student has completed.

Students may discuss other issues with the academic advisor during the meeting. Our department’s academic advisor holds a bachelor and masters degree in industrial
engineering and has 16 years industry experience working as an IE. As such, the students not only have access to expert academic advising, but they also have access to career advising in the department.

In addition to this structured process, students are encouraged to discuss their interests, concerns, and questions with any faculty member. The department has attempted to pair students with faculty members in the past for mentoring, but students did not take advantage of this opportunity. Students who are juniors and seniors tend to develop ad-hoc relationships with their favorite faculty members.

The University’s office of Career Development Services (CDS) offers students assistance in choosing a major as well as choosing a career. Assistance ranges from assessments to career counseling to job fairs and interviews. Students who are unsure if they are in the right major or who seem to be struggling academically are referred to CDS for assistance.

D. Transfer Students and Transfer Courses

*Summarize the requirements and process for accepting transfer students and transfer credit.*

Admission of transfer students is done by the institution as it is for any undergraduate student. The Office of Engineering Student Services has one of its experienced advisors specialize in working with transfer students. This transfer advisor arranges processing of transfer credit and pre-approves courses taken at other institutions. Most courses from other State of Alabama institutions have already been vetted by AU and the process is straightforward to substitute courses. The Office of the Registrar converts the courses from the other institution to actual AU course numbers and posts them to the student’s AU transcript. Grades in courses that are transferred in from other institutions are not included in students’ grade point averages (GPAs).

If there are any questions regarding the suitability of a substitution or transfer course, the transfer advisors contact the department. The department reviews the syllabus, course description and other material to determine whether the course is equivalent to one in our curriculum. If it is an acceptable substitute, a “Course Substitution Form” (see Appendix F) is originated by the academic advisor and then approved by the department chair. The form is sent to Engineering Student Services for approval and placement in the student’s permanent file.

Transfer students attend a one day orientation session, “SOS”. During this session, our department’s academic advisor meets with the transfer students to ISE to introduce them to the department and help with their academic schedules for the first semester. This session is similar to an advising appointment for students transferring from other departments within AU and the same type of activities are done as were described earlier. Table 1.2 shows the number of transfer students entering the department over the past five academic years.
<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Number of Transfer Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2010</td>
<td>3</td>
</tr>
<tr>
<td>2008-2009</td>
<td>5</td>
</tr>
<tr>
<td>2007-2008</td>
<td>5</td>
</tr>
<tr>
<td>2006-2007</td>
<td>1</td>
</tr>
<tr>
<td>2005-2006</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 1.2. Transfer Students for Past Five Academic Years

**E. Graduation Requirements**

*Summarize the process for ensuring that each graduate completes all graduation requirements for the program.*

The departmental advisor uses the Excel spreadsheet discussed in Section C “Advising Students” above as a checklist of courses completed toward the degree. Every semester, the advisor accesses the student’s transcript from Banner and then checks off courses that have been successfully completed (D or higher grade) on the Excel spreadsheet.

During the student’s penultimate semester, the student is instructed by the advisor to have a “graduation check” done by Engineering Student Services (EES). One of the academic advisors in EES will perform a graduation check upon request or at the beginning of the semester when a student registers for the graduation course, UNIV 4AA0-EN1, whichever is sooner. This check is accomplished by reviewing the student’s transcript and crossing through each course required in the INSY curriculum. Students may not graduate unless they are cleared by EES as having completed all of the requirements for graduation from their particular program. Identifying deficits (curriculum requirements not met) are rare at this stage, averaging around one per year. Usually the questions raised are caused by transfer credit not being articulated properly or by a curriculum change that occurred during the student’s tenure. The questions are usually fairly straightforward to resolve and do not affect the student’s schedule nor graduation date.

We have only had one student out of approximately 250 who have graduated from our program over the past seven years that had a potential “surprise” problem in meeting graduation requirements during the expected graduation term. That particular student did not follow the college’s procedure for advising and obtaining a graduation check, nor did he register for graduation as required by the institution. As it turns out, the student failed a course during the semester in which he expected to graduate, so the failure of the process to ensure graduation requirements are met did not delay his graduation after all. As a side note, the student did eventually complete all the requirements for graduation and received a diploma several years ago. Based on this experiential data, our process for ensuring that students meet the graduation requirements works very well. We know of no students graduating without meeting the requirements.
There is an effort ongoing at the institution level to automate the graduation check. Several companies have made presentations on campus recently and AU will most likely hire one of them in the future to develop software to automate the process.

F. Enrollment and Graduation Trends

*Summarize the enrollment and graduation trends for the past five years.*

Enrollment in ISE has grown steadily over the past five years, a 45% increase overall.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time Students</td>
<td>129</td>
<td>134</td>
<td>156</td>
<td>168</td>
<td>182</td>
</tr>
<tr>
<td>Part-time Students</td>
<td>9</td>
<td>19</td>
<td>13</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Student FTE</td>
<td>130</td>
<td>142</td>
<td>161</td>
<td>172</td>
<td>188</td>
</tr>
<tr>
<td>Graduates</td>
<td>27</td>
<td>29</td>
<td>32</td>
<td>32</td>
<td>50 (est.)</td>
</tr>
</tbody>
</table>

Table 1.3 Enrollment Trends for the Past Five Academic Years

The vast majority of students who enroll in our program graduate with a BISE degree. We have very few students (one to two per year) drop out of the program; if they do, they usually transfer out of the College of Engineering or out of Auburn. Most students take summer classes or attend an extra semester or two beyond the minimum of eight semesters. This is caused by completion of a minor, reduced course load below that required by the model curriculum of around 16 hours per semester, or students who have transferred to ISE. Those who choose to co-op will be in the program at least five years since they work the equivalent of one year while in school.

Table 1.4, requested by the ABET Self-Study Questionnaire, shows 25 representative graduates of the Spring 2010 class and their employers or graduate schools.
<table>
<thead>
<tr>
<th>Numerical Identifier</th>
<th>Year Matriculated*</th>
<th>Year Graduated</th>
<th>Initial or Current Employment/Job Title/Other Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Junior</td>
<td>2010</td>
<td>Southern Nuclear/Eng. Support</td>
</tr>
<tr>
<td>2</td>
<td>Sophomore</td>
<td>2010</td>
<td>Quorum Consulting</td>
</tr>
<tr>
<td>3</td>
<td>Senior</td>
<td>2010</td>
<td>Eaton Corp.</td>
</tr>
<tr>
<td>4</td>
<td>Freshman</td>
<td>2010</td>
<td>Frito Lay</td>
</tr>
<tr>
<td>5</td>
<td>Junior</td>
<td>2010</td>
<td>Cooper Industries</td>
</tr>
<tr>
<td>6</td>
<td>Junior</td>
<td>2010</td>
<td>Family Owned Retail Nursery</td>
</tr>
<tr>
<td>7</td>
<td>Freshman</td>
<td>2010</td>
<td>USAF/Officer Training</td>
</tr>
<tr>
<td>8</td>
<td>Freshman</td>
<td>2010</td>
<td>AMRDEC/Redstone Arsenal</td>
</tr>
<tr>
<td>9</td>
<td>Sophomore</td>
<td>2010</td>
<td>Graduate School/Auburn</td>
</tr>
<tr>
<td>10</td>
<td>Sophomore</td>
<td>2010</td>
<td>Graduate School/U. of Tenn.</td>
</tr>
<tr>
<td>11</td>
<td>Freshman</td>
<td>2010</td>
<td>Graduate School/Auburn</td>
</tr>
<tr>
<td>12</td>
<td>Freshman</td>
<td>2010</td>
<td>Grad School/Franciscan Univ.</td>
</tr>
<tr>
<td>13</td>
<td>Sophomore</td>
<td>2010</td>
<td>The Cube/London, England</td>
</tr>
<tr>
<td>14</td>
<td>Freshman</td>
<td>2010</td>
<td>Graduate School/Auburn</td>
</tr>
<tr>
<td>15</td>
<td>Sophomore</td>
<td>2010</td>
<td>Graduate School/Auburn</td>
</tr>
<tr>
<td>16</td>
<td>Sophomore</td>
<td>2010</td>
<td>Law School/U. of Georgia</td>
</tr>
<tr>
<td>18</td>
<td>Sophomore</td>
<td>2010</td>
<td>U.S. Air Force/Pilot</td>
</tr>
<tr>
<td>19</td>
<td>Sophomore</td>
<td>2010</td>
<td>ExxonMobil/Tech. Sales</td>
</tr>
<tr>
<td>20</td>
<td>Freshman</td>
<td>2010</td>
<td>AAI Corp./Defense</td>
</tr>
<tr>
<td>21</td>
<td>Sophomore</td>
<td>2010</td>
<td>Law School/U. of Alabama</td>
</tr>
<tr>
<td>22</td>
<td>Junior</td>
<td>2010</td>
<td>FM Global/Insurance</td>
</tr>
<tr>
<td>23</td>
<td>Sophomore</td>
<td>2010</td>
<td>United States Air Force</td>
</tr>
<tr>
<td>24</td>
<td>Junior</td>
<td>2010</td>
<td>Ingersoll Rand</td>
</tr>
<tr>
<td>25</td>
<td>Freshman</td>
<td>2010</td>
<td>Graduate School/Auburn</td>
</tr>
</tbody>
</table>

Table 1.4. Program Graduates – Spring 2010

* Year the student joined ISE
CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

ABET Definition: Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

Assessment under this criterion is one or more processes that identify, collect, and prepare data to evaluate the achievement of program educational objectives.

Evaluation under this criterion is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program educational objectives are being achieved, and results in decisions and actions to improve the program.

A. Mission Statement

Provide a copy or summary of any applicable institutional, college, departmental, and program Mission Statements and document where they are published.

Department of Industrial and Systems Engineering Mission Statement
Prepare our students, through high quality internationally recognized instructional programs, to practice engineering professionally and ethically in a competitive and diverse global environment. Expand scientific and engineering knowledge through innovative research and creative partnerships involving academia, industry, and government. Provide extension programs to assist individuals and organizations to find solutions to engineering problems through education, consultation, and practical research. Published on the department website, http://www.eng.auburn.edu/insy/about/mission.html.

College of Engineering Mission Statement
Prepare our students, through high quality internationally recognized instructional programs, to practice engineering professionally and ethically in a competitive global environment. Expand scientific and engineering knowledge through innovative research and creative partnerships involving academia, industry, and government. Provide extension programs to assist individuals and organizations to find solutions to engineering problems through education, consulting, and practical research. Published on the college website, http://www.eng.auburn.edu/about/mission.html.

Selected paragraph from the Institution Mission Statement
As a comprehensive university, Auburn University is committed to offering high-quality undergraduate, graduate, and professional education to its students. The University will give highest priority for resource allocation for the future development of those areas that represent the traditional strengths, quality, reputation, and uniqueness of the institution and that continue to effectively respond to the needs of students and other constituents. Consistent with this commitment, the University will emphasize a broad and superior
undergraduate education that imparts the knowledge, skills, and values so essential to educated and responsible citizens. Published on the university website, http://www.ocm.auburn.edu/welcome/visionandmission.html

B. Program Educational Objectives

List the Program Educational Objectives and state where these are published.

To graduate students with a BISE degree who will:

1. Have the technical expertise necessary for the broad practice of Industrial and Systems Engineering. This includes analytical, computational and experimental expertise and the ability to integrate and synthesize their expertise to solve complex problems.
2. View technical problems from a systems perspective with attention to human, business, equipment, materials, energy and information aspects and with appreciation of global and societal contexts.
3. Be able to effectively communicate technical ideas through oral and written media and to function effectively as members and/or leaders of diverse teams.
4. Appreciate the changing world and its effect on the practice of engineering with concern for ethics, currency of expertise and contemporary issues.

Published on the department website, http://www.eng.auburn.edu/programs/insy/programs/acred/edu-obj.html

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

Describe how the Program Educational Objectives are consistent with the Mission of the Institution.

Graduating students with technical expertise, the ability to solve complex problems from a systems perspective with an appreciation of global and societal contexts is in direct support of Auburn’s mission to “prepare Alabamians to respond successfully to the challenges of a global economy.”

Our program further teaches students to effectively communicate, work as ethical members of a team and appreciate their role in a changing world. The University’s mission is to “emphasize a broad and superior undergraduate education that imparts the knowledge, skills, and values so essential to educated and responsible citizens.”

D. Program Constituencies

List and describe the Program Constituencies.

Key constituencies associated with the program include:

- Faculty in the department—The faculty are a congenial group who work as a team to improve ISE education at Auburn. They are committed to the undergraduate
program and producing graduates who will be active citizens and make a significant impact in the broad field of industrial and systems engineering. Many of the faculty members are currently engaged in their particular field of expertise outside of the University setting as consultants, and all faculty members are engaged with research.

- **Undergraduate students in the department**—The students in our program are motivated to become successful engineers. Approximately 40% choose our program after exposure during their freshman year in the engineering orientation (or introductory) course or after speaking with current students in the program. Rarely do students leave the ISE program— if they do, it is usually to transfer to another college or institution, not to a different engineering major. About 40% of our students either intern or co-op in industry. In our program, 33% of the students are female, compared to the College of Engineering which is only 16% female.

- **Alumni of the department**—over 4,000 living alumni are represented by the ISE Alumni Council. The Alumni Council consists of 12 members who serve for a four year term led by a chair. Each member is an alumnus of the department. A diversity of professional paths and employers are represented. This council is a voice of both alumni and employers. Additional information about this group is contained in Appendix G.

- **Employers of current students and graduates**—Members of the Alumni Council, other alumni, co-op employers, and company representatives who participate in INSY 4800 -Senior Design - provide the most significant input to the process. Occasionally input may come from conversations with recruiters who visit campus to interview students, from plant visits or from conferences.

- **Graduate and professional schools** to which our graduates enter include graduate programs in engineering and business and (more occasionally) law and medical schools. Because a significant portion of our graduates who enter graduate school choose to remain in our program, we are a self constituency.

- **Students in other majors who take our courses**—ENGR 1110 (Introduction to Industrial and Systems Engineering), INSY 3020 (Safety and Ergonomics), INSY 3410 (Deterministic Operations Research), INSY 3600 (Engineering Economics), and STAT 3600 (Probability and Statistics I).

- **Faculty who advise and teach non-ISE students who take our courses**. Typically these are other faculty in the College of Engineering, but occasionally can include faculty from the College of Science and Math or the College of Business.

### E. Process for Establishing Program Educational Objectives

*Describe the process that periodically documents and demonstrates that the Program Educational Objectives are based on the needs of the program's various constituencies.*

Objectives are posted to the ISE department website and are infrequently altered (they were last changed in 2003) but inform all that we do in the department. If changes to the objectives are in order the ISE faculty is the primary decision making body, and it is closely guided by the ISE Alumni Council.
The faculty and Alumni Council reviewed the Program Educational Objectives (PEOs) at the Fall 2008 meeting. There was unanimous agreement that the objectives as written are still valid and do not need to be changed. There was also agreement that reviewing the objectives routinely about once every five years is adequate.

The College of Engineering and the Center for Governmental Services at Auburn conducted two surveys in 2008, one for alumni and one for industry. We specifically asked our Industrial and Systems Engineering program alumni about our PEOs. The results are documented in Figure 2.1. As can be seen, the vast majority of those answering the survey believe that each of the objectives is either somewhat or very important to them (94% to 100% agreement for each objective).

<table>
<thead>
<tr>
<th>Objective</th>
<th>Somewhat Important</th>
<th>Very Important</th>
<th>Moderately Well</th>
<th>Very Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>The technical expertise necessary for the broad practice of Industrial and Systems Engineering, including analytical, computational and experimental expertise and the ability to use their expertise to solve complex problems</td>
<td>68%</td>
<td>29%</td>
<td>97%</td>
<td>94%</td>
</tr>
<tr>
<td>View technical problems from a systems perspective, including human, business, equipment, materials, energy and information aspects, and with appreciation of global/societal contexts</td>
<td>66%</td>
<td>31%</td>
<td>97%</td>
<td>88%</td>
</tr>
<tr>
<td>Be able to effectively communicate technical ideas through oral and written media and to function effectively as members and/or leaders of diverse teams</td>
<td>90%</td>
<td>10%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Appreciate the changing world and its effect on the practice of engineering with concern for ethics, currency of expertise and contemporary issues</td>
<td>26%</td>
<td>68%</td>
<td>94%</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.1 Importance of Program Educational Objectives

The Industry Survey was conducted by telephone with engineering employers who have a relationship with the University and focused on the qualities an employer looks for in hiring an engineer.

The three qualities of job performance cited most often by the employers were 1) the ability for newly hired engineers to learn on their own (84%); 2) experience in communicating technical information through written documents (78%); and 3) in-depth technical knowledge of the students’ major engineering disciplines (73%). These same three qualities also ranked at the top of the surveys conducted in 1998 and 2003—the last two times it was done.

Also of interest was the comparison between the alumni and industry surveys. Clearly the alumni and the employers agree that the ability to learn on his or her own is the
number one quality that an Auburn engineer should possess with written communication following closely in desirability.

<table>
<thead>
<tr>
<th>Qualities of Job Performance</th>
<th>Industry</th>
<th>Rank Orders</th>
<th>Alumni</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to learn on their own</td>
<td>84%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Experience in communicating technical information through written documents</td>
<td>78%</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>In-depth technical knowledge of the student’s major engineering discipline</td>
<td>73%</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Experience in working with people of different genders, races, and cultural backgrounds</td>
<td>69%</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Experience in communicating technical information through oral presentations</td>
<td>69%</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Experience using or ability to quickly learn existing software to solve practical problems</td>
<td>64%</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Experience in working on practical design projects</td>
<td>63%</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Co-op experience with industry</td>
<td>47%</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>A summer internship with industry</td>
<td>45%</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Other job experience in working on practical projects</td>
<td>43%</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Experience in working with students from other engineering disciplines in solving large-scale practical problems</td>
<td>31%</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Experience in working in teams with students from outside the engineering college to solve large-scale practical problems</td>
<td>30%</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Well-rounded background demonstrated from choice of elective course work outside of engineering</td>
<td>28%</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Knowledge of several areas of engineering outside of the student’s major discipline</td>
<td>21%</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Ability to develop custom computer software using C, Matlab, Fortran, or other high-level languages for specific applications</td>
<td>15%</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 2.1 Qualities of Job Performance

It is worthwhile to compare the information in Table 2.1 to our four (4) PEOs. Table 2.2 below shows the top six qualities that industry considers most important according to the survey and the PEO number that most directly relates to each quality. It is obvious from the table that there is a tight correlation between our objectives and industry’s desires.

<table>
<thead>
<tr>
<th>Top Six Qualities Desired by Industry</th>
<th>Program Educational Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to learn on their own</td>
<td>1</td>
</tr>
<tr>
<td>Experience in communicating technical information through written documents</td>
<td>3</td>
</tr>
<tr>
<td>In-depth technical knowledge of the student’s major engineering discipline</td>
<td>1,2</td>
</tr>
<tr>
<td>Experience in working with people of different</td>
<td>3</td>
</tr>
</tbody>
</table>
genders, races, and cultural backgrounds

| Experience in communicating technical information through oral presentations | 3 |
| Experience using or ability to quickly learn existing software to solve practical problems | 1, 4 |

**Table 2.2 Industry Survey/Relationship to PEOs**

The primary constituencies for the PEOs are a subset of all the program’s constituencies, namely alumni (represented by the Alumni Council and surveyed in 2008), faculty, employers of graduates (surveyed in 2008), and graduate schools (of which we are a self constituency). We believe that our current process for establishing PEOs and ensuring that they are based on the needs of our defined constituencies is working well. Each of the constituencies has been surveyed or has been directly involved in the process of defining and affirming the PEOs.

**F. Achievement of Program Educational Objectives**

*Describe the assessment and evaluation process that periodically documents and demonstrates the degree to which the Program Educational Objectives are attained.*

As discussed previously, the Program Educational Objectives (PEOs) are rarely changed. They are difficult to assess from both time and cost point of views as a complete assessment requires surveys of alumni and employers. Our process is to assess them formally every six years and informally whenever possible. The assessments are analyzed by the faculty and shared with the Alumni Council to determine if changes are needed. Figure 2.2 graphically portrays the assessment and evaluation process for our PEOs.
In Section E above of Criterion 2, Figure 2.1 affirms that our PEOs are appropriate according to our alumni and also shows the degree to which our alumni believe that we are meeting the objectives. This assessment is the most direct assessment of our alumni constituency for our PEOs. To summarize from Figure 2.1, 94% of our alumni believe that we are meeting Objective 1 either well or moderately well, 88% for Objective 2, 66% for Objective 3, and 78% for Objective 4.

This survey data is reviewed by the faculty and the Alumni Council to determine if change is warranted. In general, any deficit or shortcoming becomes an item on our agenda at a future faculty and/or Alumni Council meeting. Depending on the item, a subcommittee may be formed, a single person may be given an action item to further investigate, or any number of possible further actions can be taken.

At the time of this writing, we are satisfied with the results of the survey except for Objective 3. We are in the process of developing a plan to review all the opportunities students have for communication and teamwork to determine if we can enhance this area. The former item will also be covered by the new Auburn University Writing Initiative.
and we have been charged by that initiative to formulate our own department plan regarding writing. This will be ongoing during 2010.

As stated earlier in the Background section of this report, graduates of our program (33 respondents) were more satisfied overall (97%) in their educational experience than those in any other program in the college. This high level of satisfaction implies that graduates believe their education in the ISE department prepared them well for their professional endeavors.

There were two other parts of the alumni survey that indirectly relate to our PEOs. Table 2.3 shows desirable areas for job performance and the degree to which alumni believe they have been satisfied by our program. This data comes only from the alumni from the ISE program.

<table>
<thead>
<tr>
<th>Area</th>
<th>Desirable for job performance</th>
<th>Satisfied by program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to learn on one’s own</td>
<td>91%</td>
<td>76%</td>
</tr>
<tr>
<td>Written communication</td>
<td>88%</td>
<td>45%</td>
</tr>
<tr>
<td>Oral communication</td>
<td>94%</td>
<td>42%</td>
</tr>
<tr>
<td>Working with diverse groups</td>
<td>82%</td>
<td>82%</td>
</tr>
<tr>
<td>Technical knowledge</td>
<td>76%</td>
<td>85%</td>
</tr>
<tr>
<td>Experience with existing software</td>
<td>73%</td>
<td>73%</td>
</tr>
<tr>
<td>Co-op experience</td>
<td>61%</td>
<td>67%</td>
</tr>
<tr>
<td>Internship experience</td>
<td>64%</td>
<td>58%</td>
</tr>
<tr>
<td>Engineering knowledge outside major</td>
<td>39%</td>
<td>67%</td>
</tr>
</tbody>
</table>

Table 2.3 Desirable Areas for Job Performance and the Degree to which they are Satisfied by the Program

There is fairly high correlation in most of the areas, except for “Written and oral communication” and “Engineering knowledge outside major”. This is the second assessment instrument that highlights a weakness in the “communication” area. In addition, the survey shows that while 67% of our alumni are satisfied with “Engineering knowledge outside major”, only 39% believe it is desirable for job performance. Our curriculum committee is planning to benchmark our curriculum with peer IE departments in the next year as one way to look at the issue of appropriateness of engineering material outside our major. Our faculty has discussed this issue many times over the years. For example, some of the faculty members believe that the Electrical Engineering class should be removed from the required curriculum and replaced by an industrial engineering course. However, there has not been enough support for this change. Our practice is to have faculty consensus for curriculum changes. We will continue to evaluate our curriculum as an on-going process.

The second part of the alumni survey that gives valuable information regarding our PEOs was a question about the tools the alumni use at work. The results of the survey are shown in Figure 2.3 below.
This data confirms that all of the basic industrial engineering areas being taught by our program are being used to at least some extent by our graduates in the real world.

Another indirect assessment of our PEOs is the fact that the same employers return to hire our graduates year after year. Also, we have relationships with many of our alumni and they come to us for student interns as well as new professional hires.

As mentioned before, we are a self constituent as a graduate school that our students attend. Our undergraduate students who attend our graduate program are outstanding performers in general, again implying achievement of our PEOs. We have only had a few students (two out of approximately 25) over the last six years who dropped out of the graduate program without obtaining a degree and these cases were due to personal, not academic, reasons.

Based on the information that we have from our formal and informal assessments, we are achieving our Program Educational Objectives to a large extent, however we need to increase ways for our students to gain experience in written and oral communication. This melds in with our current partnership with the new Writing Initiative on campus.
CRITERION 3. PROGRAM OUTCOMES

A. Process for Establishing and Revising Program Outcomes

Describe the process used for establishing and revising program outcomes.

The outcomes that we had at the last review in 2004 were as follows and were developed before the ABET outcomes (a-k) existed in their present form. The ABET outcomes that were covered in each of these outcomes are shown in parenthesis after each of the former outcomes.

1. Knowledge of mathematical and scientific principles that underlie the basic application areas of Industrial and Systems Engineering, including: systems analysis, engineering economics, production and inventory control, project management and scheduling, manufacturing systems and processes, quality, human performance and safety. (a, b, c)

2. Ability to complete a comprehensive design problem that proposes feasible solutions to a complex ISE problem and includes the following considerations: economic, environmental, sustainability, ethical, health and safety, social and political. (e, f, h, k, l, m)

3. A commitment to continue developing knowledge and skills after graduation. (i, j)

4. Ability to work in teams and to communicate technical ideas to team members and consumers in both written and oral form. (d, g)

The faculty reviewed the program outcomes in Fall 2008 and agreed that the four program outcomes were essentially equal to the ABET engineering (a-k) plus program outcomes (which we call l and m). The faculty agreed that it would be easier and more straightforward when doing our measurements and assessments to simply change our outcomes to match the language and format of the ABET general and program-specific outcomes. This recommendation was presented to the ISE Alumni Council in Fall 2008 and the Council agreed with the recommendation. We did not present the change to other constituencies for input because the outcomes did not change in substance.

Figure 3-1 shows an overview of the program outcomes creation, assessment and revision process. Like objectives, program outcomes are modified very infrequently as we believe they constitute a relevant and comprehensive set. We used this process to make the 2008 change, specifically faculty analysis and alumni council input. Substantive changes would involve other program constituencies and the review of multiple types of assessment data as shown in the figure.
B. Program Outcomes

List the Program Outcomes and describe how they encompass Criterion 3 and any applicable Program Criteria. Indicate where the Program Outcomes are documented.

The current program outcomes are listed below. A graduate who has successfully gained all of the skills, knowledge, and behaviors present in the following outcomes would have a complete toolset necessary to achieve the program’s objectives.

Each Industrial and Systems Engineering student will have demonstrated the following:

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 techniques, skills, and modern engineering tools necessary for engineering practice.

l) Be able to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.

m) Be able to integrate systems using appropriate analytical, computational and experimental practices.

Program outcomes are published on the department website (http://www.eng.auburn.edu/insy/programs/acred/outcomes.html) and also are published in the introduction to our program in the AU Bulletin (http://www.auburn.edu/student_info/bulletin).

C. Relationship of Program Outcomes to Program Educational Objectives

Describe how the Program Outcomes lead to the achievement of the Program Educational Objectives.

The tight correlation between program outcomes and program educational objectives is illustrated in Figure 3-2. By meeting the program’s outcomes students gain the tools necessary to flourish in the professional world. These skills in turn allow graduates to achieve the program’s educational objectives by succeeding after graduation and reaching their long-term goals.

D. Relationship of Courses in the Curriculum to the Program Outcomes

Describe the relationship of courses in the curriculum to the Program Outcomes.

In the required curriculum for the BISE degree, a mapping from coursework to outcomes can be made where the degree of emphasis of each outcome in the various required courses is shown. This correlation between curriculum and program outcomes is drawn in Figure 3.3.
## Mapping of Program Outcomes to Program Objectives

<table>
<thead>
<tr>
<th>Program Outcome</th>
<th>Program Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>a An ability to apply knowledge of mathematics, science, and engineering.</td>
<td>1 Have the technical expertise necessary for the broad practice of Industrial and Systems Engineering. This includes analytical, computational and experimental expertise and the ability to integrate and synthesize their expertise to solve complex problems.</td>
</tr>
<tr>
<td>b An ability to design and conduct experiments, as well as to analyze and interpret data.</td>
<td></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></td>
</tr>
<tr>
<td>e An ability to identify, formulate, and solve engineering problems.</td>
<td></td>
</tr>
<tr>
<td>f An understanding of professional and ethical responsibility. 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>h An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.</td>
<td>2 View technical problems from a systems perspective with attention to human, business, equipment, materials, energy and information aspects and with appreciation of global and societal contexts.</td>
</tr>
<tr>
<td>k Be able to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.</td>
<td></td>
</tr>
<tr>
<td>l Be able to integrate systems using appropriate analytical, computational and experimental practices.</td>
<td></td>
</tr>
<tr>
<td>m An ability to function on multidisciplinary teams.</td>
<td></td>
</tr>
<tr>
<td>d An ability to communicate effectively.</td>
<td>3 Be able to effectively communicate technical ideas through oral and written media and to function effectively as members and/or leaders of diverse teams.</td>
</tr>
<tr>
<td>g A recognition of the need for, and an ability to engage in life-long learning.</td>
<td></td>
</tr>
<tr>
<td>j A knowledge of contemporary issues.</td>
<td>4 Appreciate the changing world and its effect on the practice of engineering with concern for ethics, currency of expertise and contemporary issues.</td>
</tr>
</tbody>
</table>
### Required Courses and Their Emphasis on Program Outcomes

<table>
<thead>
<tr>
<th>Outcome Emphasized by Course</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
<th>l</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Math and Science Courses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 1610</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 1620</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2630</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2650</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2660</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 1030/31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 1600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 1610</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3610/11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Basic Engineering Core</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 1100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 1110</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMP 1200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 2100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMP 3010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC 3810</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR Elective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Industrial and Systems Engineering Core</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3410</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3420</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4330</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY Electives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General Education Requirements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Elective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soc Sci Core</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English Core</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History Core</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine Arts Core</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.3 Required Courses and Their Emphasis on Program Outcomes**
E. Documentation

Describe by example how the evaluation team will be able to relate the display materials, i.e., course syllabi, sample student work, etc., to each Program Outcome.

We developed a matrix in 2004 to assess each of the program outcomes across multiple courses. Each outcome is measured across two or more courses (see Table 3.1) and each of our required courses has one or more outcomes to measure (see Table 3.2). We set a goal in 2004 to complete an analysis of each course’s outcomes three times during the period between ABET visits. Since most of our required courses are taught only once per year, this usually means we complete a course outcomes analysis for each course on the average of every other year. When instructors or other elements change, we sometimes choose to analyze a particular course over consecutive years or even over consecutive semesters. Our analyses are contained in the course books, which contain the syllabus, the specific assessment, and the assessment results for a particular course taught during a semester. The course books also contain audits completed by another professor in the department and an audit response form that the course instructor fills out.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>STAT 3600, STAT 3610, INSY 3410, INSY 3400, INSY 3800</td>
</tr>
<tr>
<td>b</td>
<td>STAT 3600, STAT 3610, INSY 3021, INSY 3400</td>
</tr>
<tr>
<td>c</td>
<td>INSY 3021, INSY 3800, INSY 4700</td>
</tr>
<tr>
<td>d</td>
<td>INSY 4800, ENGR 1110, INSY 3020</td>
</tr>
<tr>
<td>e</td>
<td>INSY 3410, INSY 3600, INSY 3420</td>
</tr>
<tr>
<td>f</td>
<td>INSY 4330, INSY 3020, INSY 4500</td>
</tr>
<tr>
<td>g</td>
<td>INSY 4700, INSY 4800, INSY 3021, INSY 4500</td>
</tr>
<tr>
<td>h</td>
<td>INSY 4500, INSY 3020, INSY 3600</td>
</tr>
<tr>
<td>i</td>
<td>ENGR 1110, INSY 3020, INSY 4500</td>
</tr>
<tr>
<td>j</td>
<td>INSY 3600, INSY 4330</td>
</tr>
<tr>
<td>k</td>
<td>STAT 3611, INSY 3410, INSY 3700, INSY 3420</td>
</tr>
<tr>
<td>l</td>
<td>INSY 4800, ENGR 1110, INSY 4330</td>
</tr>
<tr>
<td>m</td>
<td>INSY 4330, INSY 3700, INSY 4800</td>
</tr>
</tbody>
</table>

Table 3.1 Courses in Which Outcomes are Assessed
The specific metrics for each outcome that were developed in 2004 are shown below. Instructors may change the specific assessment used each time they teach the course; however, they are to make sure that they are assessing the outcome as assigned in the matrix with a specific assessment (homework question, project, test question, etc.) This process insures that we are getting a cross section of assessments across courses for each outcome. The process also ensures that the work of assessment is spread among the courses and faculty.

### Table 3.2 Outcomes Assessed in Each Course

<table>
<thead>
<tr>
<th>Course</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
<th>l</th>
<th>m</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 1110</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>INSY 3020</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3021</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3400</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3410</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3420</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3600</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3700</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3800</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4330</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4500</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4700</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4800</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3600</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3610</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3611</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>
(a) an ability to apply knowledge of mathematics, science, and engineering

<table>
<thead>
<tr>
<th>CLASS</th>
<th>ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 3600 PROB &amp; STAT I</td>
<td>Use of (combinatorial) mathematics to compute the unconditional and conditional probabilities of events.</td>
</tr>
<tr>
<td>STAT 3610 PROB &amp; STAT II</td>
<td>Specific test questions on statistical inference about parameters of one or more normal populations (such as test of hypothesis and confidence intervals).</td>
</tr>
<tr>
<td>INSY 3410 DETERMINISTIC O.R.</td>
<td>Test question to measure competency in using Linear Algebra and the simplex algorithm to solve a linear programming problem.</td>
</tr>
<tr>
<td>INSY 3400 STOCHASTIC O.R.</td>
<td>A test question to measure the ability of the student to apply queuing theory to the solution of a decision-making problem subject to uncertainty.</td>
</tr>
<tr>
<td>INSY 3800 MANUFACTURING PROCESSES</td>
<td>Students are tested on their understanding of the Introduction to Materials Science (MATL 2100) which includes the science of solid materials and the relationship between this science and material properties.</td>
</tr>
</tbody>
</table>

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

<table>
<thead>
<tr>
<th>CLASS</th>
<th>ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 3600 PROB &amp; STAT I</td>
<td>Homework and exam questions on data summary and tabulation.</td>
</tr>
<tr>
<td>STAT 3610 PROB &amp; STAT II</td>
<td>Homework and exam questions on Fractional Factorials designs in base 2.</td>
</tr>
<tr>
<td>INSY 3021 METHODS ENGINEERING, WORK MEASUREMENT &amp; ERGONOMICS</td>
<td>Students are required to complete a homework assignment in which they analyze time studies to develop a work sampling study. The students determine the confidence and accuracy levels required to achieve the study objectives, p-hat, and calculate the appropriate number of samples to ensure the collection of statistically valid data.</td>
</tr>
<tr>
<td>INSY3400 STOCHATIC O.R.</td>
<td>A homework assignment to measure the ability of the student to design a computer simulation model of a queuing system using a spreadsheet such as Excel. The parameters of the model are modified and the output generated by the computer model is analyzed and</td>
</tr>
</tbody>
</table>
compared with the output of an analytical model.

(c) an ability to design a system, component, or process to meet desired needs

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 3021 METHODS ENGINEERING, WORK MEASUREMENT &amp; ERGONOMICS</td>
<td>In the Workstation Design written lab report, students develop a method to assemble basic products, such as flashlights. Students compare alternate layouts for efficiency and ergonomic risk factors. Students develop a production standard (based on their own time studies) for assembling a flashlight under alternate layouts.</td>
<td></td>
</tr>
<tr>
<td>INSY 3800 MANUFACTURING PROCESSES</td>
<td>A lab where the students design a manufacturing cell (part of a manufacturing system) to make a component; A NC process plan to make the fatigue specimen, a NC process plan for a three axis NC machine, a work holding device for the component they made a process plan for.</td>
<td></td>
</tr>
<tr>
<td>INSY 4700 MANUFACTURING SYSTEMS</td>
<td>Students are challenged with the ability to design an “optimized” facility layout based on product traffic flow, process areas, and facility constraints. Another illustration is the design and analysis of an automated storage system based on physical dimensions, servicing times, and transfer speeds. Finally, students are challenged to design a station sequencing process based on production rates, process cycle times, and process sequence requirements.</td>
<td></td>
</tr>
</tbody>
</table>

(d) an ability to function on multi-disciplinary teams

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 4800 SENIOR DESIGN</td>
<td>The mid-term oral and report reflects the team’s (composed of IE students) ability to interact with various departments and individuals from other fields while gathering data and developing their project for the company.</td>
<td></td>
</tr>
<tr>
<td>ENGR 1110 INTRODUCTION TO ENGINEERING</td>
<td>Students work within a multi-disciplinary team and design a production model aircraft that meets statistical quality control performance goals. The team must optimize the manufacturing floor to minimize variable and fixed costs in the production of the project using the basic skills provided in the introductory survey classes and laboratories. The project includes preliminary reports, final reports and a team</td>
<td></td>
</tr>
</tbody>
</table>
### (e) an ability to identify, formulate, and solve engineering problems

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 3020 Ocupational Safety and Ergonomics</td>
<td>Students from several degree areas will be randomly assigned to two teams during a practical exercise on human error and asked to evaluate two different maintenance tasks.</td>
<td></td>
</tr>
</tbody>
</table>

### (f) an understanding of professional and ethical responsibility

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 4330 Statistical Quality Design and Control</td>
<td>A homework assignment about the need for data integrity, not fudging numbers, and how not to “lie with statistics.” A test question about Deming’s Red Bead Exercise about not passing defective products.</td>
<td></td>
</tr>
<tr>
<td>INSY 3020 Ocupational Safety and Ergonomics</td>
<td>Homework during week one that checks for understanding of the engineer’s professional responsibility for designing workplaces that protect the health and safety of workers.</td>
<td></td>
</tr>
<tr>
<td>INSY 4500 Professional Practice</td>
<td>An assignment requiring students to take the NSPE ethics exam.</td>
<td></td>
</tr>
</tbody>
</table>

### (g) an ability to communicate effectively

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 4700 Manufacturing</td>
<td>Students are graded on a presentation of a team project where they work to complete a basic manufacturing</td>
<td></td>
</tr>
</tbody>
</table>
systems engineering problem using learned concepts, translate these basic solutions to a series of more complex problems, formulate a methodology to solve a real world complex problem and present their results to the class. Team members are required to present specific engineering case results to the class to explain 1) objective 2) potential solutions 3) methods for best solutions 4) limitations and assumptions 5) conclusions. This effort is intended to represent an engineering team approach in industry and a typical presentation to supervisor and mid-level engineering management.

**INSY 4800 SENIOR DESIGN**

Presentation of proposal. Must adhere to time limit, must be clear, concise. All group members must present and decide (in advance) how to divide the presentation. Assessment on (a) adhering to time limit, (b) clarity of slides, (c) comprehensive coverage of the proposed project.

**INSY 3021 METHODS ENGINEERING, WORK MEASUREMENT & ERONOMICS**

Students are required to write formal lab reports for 7 out of 14 labs. The other labs will require groups to answer questions relevant to the topic and/or analyze data.

**INSY 4500 PROFESSIONAL PRACTICE**

Students are graded on an oral presentation on *How to Give an Oral Presentation.*

(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context.

**INSY 4500 PROFESSIONAL PRACTICE**

International write-up about the sustainability in the business environment of countries other than the USA.

**INSY 3020 OCCUPATIONAL SAFETY AND ERGONOMICS**

Students are tested on the general/global responsibility that all engineers have for designing systems that protect the health and safety of workers and their related environment.

**INSY 3600 ENGINEERING ECONOMY**

A test question on foreign exchange rates and the impact on businesses that obtain materials and supplies from these countries.

(i) a recognition of the need for, and an ability to engage in life-long learning

**ENGR 1110 INTRODUCTION**

Students are encouraged to join professional organizations and attend cross-disciplinary meetings.
Virginia Tech 

<table>
<thead>
<tr>
<th>Course Code and Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO ENGINEERING</td>
<td>Attendance and membership records of professional organizations are documented.</td>
</tr>
<tr>
<td>INSY 3020 OCCUPATIONAL SAFETY AND ERGONOMICS</td>
<td>A test question concerning the type of organizations available for students and the professional organizations that are available after graduation. To include the benefits of membership in these organizations and how they contribute to the students pursue lifelong learning regarding OS&amp;E topics and considerations.</td>
</tr>
<tr>
<td>INSY 4500 PROFESSIONAL PRACTICE</td>
<td>Students are surveyed about the opportunities for involvement in professional organization and their goals for furthering their education.</td>
</tr>
</tbody>
</table>

(j) a knowledge of contemporary issues

<table>
<thead>
<tr>
<th>Course Code and Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 3600 ENGINEERING ECONOMY</td>
<td>Financial ratio analysis of Auburn University – included as part of homework 2. Student gets current financial statements of the university off the web and calculates the set of most used financial ratios. Since these ratios are designed for public corporations, the students must synthesize their understanding of the ratios to adapt them to AU. They are also asked to give their impression of the financial situation at AU based on this. Stock, Bond, Money Market Investment Simulation – All students are required to participate in an investment “game” to help the student understand the subject of market investment options and the risks and rewards associated with these investments. The game is serviced by Stock Quest and allows the student to monitor their investment portfolio and compare their results with the rest of the class. Students are graded on participation and performance.</td>
</tr>
<tr>
<td>INSY 4330 STATISTICAL QUALITY DESIGN AND CONTROL</td>
<td>Total Quality Management is a contemporary management style. A guest speaker on Motorola’s 6-sigma business strategy. A plant tour to see control charts in practice. Exam questions and evaluation of speaker and tour.</td>
</tr>
</tbody>
</table>

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3611</td>
<td>PROBABILITY &amp; STATISTICS II LAB</td>
<td>STAT Labs 1, 2, &amp; 3 Using Excel and Minitab to perform descriptive statistics. Drawing random samples from a relatively large population to illustrate the concept of bias in estimation and to verify that the standard error of the mean is equal to standard deviation of individuals divided by the square root of the sample size.</td>
</tr>
<tr>
<td>INSY3410</td>
<td>DETERMINISTIC OPERATIONAL RESEARCH</td>
<td>Test to measure competency in the use of LINGO programming language to solve deterministic OR problems</td>
</tr>
<tr>
<td>INSY3700</td>
<td>OPERATIONS PLANNING AND CONTROL</td>
<td>Homework problem that will check for retention of ability to use LINGO as covered in INSY3410 (Deterministic Operational Research).</td>
</tr>
<tr>
<td>INSY3420</td>
<td>SIMULATION</td>
<td>A graded lab assignments using Arena (simulation package) to develop a simulation model to analyze systems.</td>
</tr>
</tbody>
</table>

1) be able to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY4800</td>
<td>SENIOR DESIGN</td>
<td>Final written project report regarding consideration of people aspects of project. This might include safety, work measurement, training, fixturing and work aids, number of workers, etc. Metric – for each project, did the group consider the relevant people aspects of their technical project and integrate these considerations into their proposed solution/design?</td>
</tr>
<tr>
<td>ENGR1110</td>
<td>INTRODUCTION TO ENGINEERING</td>
<td>Students work within a multi-disciplinary team and design a production model aircraft that meets statistical quality control performance goals. The team must optimize the manufacturing floor to minimize variable and fixed costs in the production of the project using the basic skills provided in the introductory survey classes and laboratories. The project includes team competition, preliminary reports, final reports and a team PowerPoint presentation to the class.</td>
</tr>
<tr>
<td>INSY4330</td>
<td>STATISTICAL QUALITY DESIGN AND CONTROL</td>
<td>Homework problem using Ishikawa Diagram (fishbone) to systematically look at effects and the causes that create or contribute to those effects.</td>
</tr>
</tbody>
</table>
m) be able to integrate systems using appropriate analytical, computational and experimental practices.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 4330</td>
<td>STATISTICAL QUALITY DESIGN AND CONTROL</td>
<td>Homework and exam questions indicating students ability to use experiment design to link customer requirements to end-of-line product characteristics, to process characteristics and then to determine optimum set-points for processes before beginning process control.</td>
</tr>
<tr>
<td>INSY 3700</td>
<td>OPERATIONS PLANNING AND CONTROL</td>
<td>Students solve a case study requiring the integration of analytical and computational skills.</td>
</tr>
<tr>
<td>INSY 4800</td>
<td>SENIOR DESIGN</td>
<td>The students discuss in their final written report how they integrated each system and the effect to the project.</td>
</tr>
</tbody>
</table>

There are 16 required courses in our program that are taught by faculty in our department; since we assemble course books approximately every other year, there are 48 course books (16 x 3) containing the outcome metric analyses. These course books will be available for the evaluation team to review during their visit.

If the evaluation team wants to focus on a particular outcome, there will be “outcome books” which contain duplicate information from each of the course books for that particular outcome. For example, if the evaluator wants to focus on outcome 1, the evaluator could use Table 3.1 to identify the courses that assess this outcome. On the other hand, the evaluator could also look at the outcome 1 book which contains summary data for all the courses which measure outcome 1 (ENGR1110, INSY 4330, INSY 4800). Trend information for the course book years is also provided in the outcome books.

**F. Achievement of Program Outcomes**

*Explain the assessment and evaluation processes that periodically document and demonstrate the degree to which the Program Outcomes are attained. Describe the level of achievement of each Program Outcome. Discuss what evidence will be provided to the evaluation team that supports the levels of achievement of each Program Outcome.*

Table 3.3 below shows our outcomes assessment methods and the following paragraphs describe each assessment method in more detail.
Table 3.3 Assessment Tools for ISE Program Outcomes

<table>
<thead>
<tr>
<th>Evaluation Tool</th>
<th>Who</th>
<th>How Often</th>
<th>Linked Outcomes</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Outcome Metrics within courses</td>
<td>Faculty</td>
<td>each semester</td>
<td>a-m</td>
<td>Provides multiple measures for each outcome, mostly quantitative. Metrics are peer audited to insure they remain up to date and support program outcomes sufficiently.</td>
</tr>
<tr>
<td>Senior Exit Surveys and Interviews</td>
<td>Graduating seniors</td>
<td>every term</td>
<td>b,d,g,i,k,l,m</td>
<td>Rich source of data concerning every aspect of our BISE program. Interviews provide elaboration.</td>
</tr>
<tr>
<td>FE Results</td>
<td>upper-class students and recent graduates</td>
<td>semi-annual</td>
<td>a,e</td>
<td>Objective measure of basic engineering and industrial engineering knowledge.</td>
</tr>
<tr>
<td>Co-op Data</td>
<td>Co-op Students/Employers</td>
<td>every term</td>
<td>a-m</td>
<td>Objective measure from outside the program.</td>
</tr>
<tr>
<td>Faculty Awareness/Expertise</td>
<td>Faculty</td>
<td>continuous</td>
<td>a-m</td>
<td>Continuous Improvement is a department philosophy and daily operating methodology.</td>
</tr>
<tr>
<td>Bench-marking</td>
<td>Faculty</td>
<td>continuous</td>
<td>a-m</td>
<td>Auburn University, the College of Engineering, and our program continually benchmark informally and formally.</td>
</tr>
</tbody>
</table>

Detailed Outcome Metrics within Courses. This method has already been discussed in Section E within Criterion 3. An example of how this assessment method works is as follows: Outcome j (a knowledge of contemporary issues) is assessed in INSY 3600 and INSY 4330. In INSY 3600, a homework assignment was given as follows: Students were assigned to do a financial ratio analysis of Wal-Mart’s current condition. The students had to download current financial statements, compute various ratios, and provide their analysis of how well Wal-Mart was performing in different areas (asset management, debt management, etc.) as well as they had to compare Wal-Mart’s performance with the industry average. At the end of the semester, the grades on the homework were examined to see how many As, Bs, Cs, etc. there were in the class. The instructor uses this data to decide if the students are learning the material through this
homework assignment. For example, if no one in the class received an “A” or “B”, the instructor might review the assignment to see if it could be improved or strengthen the teaching material which covered the material leading up to the homework assignment. In our program, we don’t have specific targets for these assessments (such as the average grade must be “C” or above 80%); rather we rely on the individual instructors to decide if they need to make changes to their teaching or assessment methods. The assessment is also audited by another instructor in the department, primarily to put another set of eyes on the process. In addition, the ABET coordinator takes all of the assessments for each outcome and performs trend and aggregate analysis for each outcome. This trend and aggregate data is used to inform the faculty of any issues that might need to be addressed to improve the meeting of outcomes for our students.

Senior Exit Surveys and Interviews. Graduating seniors complete written exit surveys. In addition, the department chair reviews the exit survey individually and in person with each student. A copy of the survey is contained in Appendix H. The completed surveys are circulated for faculty to read. The survey data is entered into an Access file for analysis. The analysis is shared with faculty and the ISE Alumni Council once per year. Action items are developed if required and assigned to either an individual faculty or staff member or a committee of several faculty/staff.

The Access file and detailed analysis information will be available for review during the on-site visit. To summarize some key results:

- From 2005 through 2009 the proportion of graduates who changed majors into ISE was fairly steady. On average, half of our graduates transferred from another major.

- Most of our graduates entered the department as freshmen or sophomores, 39% and 41% respectively.

- The total percentage of graduates who participated in co-op or worked an internship during their time in the department was relatively steady and averaged around 75%.

- IIE membership was relatively steady over the past five years. On average just over half of the department’s graduates joined the professional society.

- On average 50% of our graduates took or plan to take the FE exam.

- 72% of graduates had received a job offer at the time of graduation.

- Nearly all students report their understanding of ISE skills and knowledge as Good or Excellent. Only three respondents of the past five graduating classes reported their understanding as Fair or Poor.

- Senior project experience from the student’s perspective is consistently Good or Excellent for the vast majority of graduating students.

- The majority of our students anticipate further education within five years.

- With the exception of two graduates, all students rated their ability to work as part of a team as Excellent or Good.
• Nearly all students rate their ability to communicate as Excellent or Good.

FE (Fundamentals of Engineering Exam) Results. Results are shared with the faculty each time a report is issued (semi-annually) and the ISE Alumni Council annually. Our overall pass rate was 80% which compares favorably with the national IE pass rate of less than 70%.

When compared to the other engineering disciplines our students performed exceptionally in Engineering Probability and Statistics, Ethics and Business Practices, Engineering Economics, Industrial Management, Facilities and Logistics, Quality, and Human Factors. In comparison to other disciplines our students performed poorly in Material Properties, Fluid Mechanics, and Thermodynamics. These outcomes would be expected given the focus of our curriculum.

Co-Op Data. The Cooperative Education (Co-Op) office surveys engineering student participants at the time of their graduation regarding the extent to which their Cooperative Education experience assisted the student in achieving the (a-k) outcomes required by ABET and used by our program as our desired outcomes. The survey uses a five point scale, where five indicates that the co-op experience always assisted the student in meeting the criteria, while a 4 represents often, 3 sometimes, 2 rarely, 1 never, and 0 indicates does not apply. For all engineering graduates (430 respondents) during the period from spring 2005 through fall 2009, the highest average on any particular survey item was 4.55 (Ability to communicate effectively) and the lowest was 3.90 (Knowledge of contemporary issues). For Industrial & Systems Engineering co-op students (a total of 18 participated in the survey), the highest average was also for the “Ability to communicate effectively” (4.39) and the lowest was for “Ability to apply knowledge of his/her academic discipline” (3.56). The average response across all outcomes was 4.17 for all engineering students and 3.97 for ISE students. This data indicates that co-op students believe that their work experience assists in achieving the program outcomes, a result not unexpected. Of course, our program does not rely on the co-op experience to meet the outcomes as students are not required to co-op.

The Cooperative Education program also surveys the immediate supervisors of co-op students. The supervisors are asked to compare the performance of the student with others at an equivalent academic and experience level. They are asked to assess performance relative to the eleven ABET outcomes plus six additional areas (technical preparation, attendance and punctuality, attitude and work ethic, initiative, relations with others, and overall performance). The scale ranges from 5 (outstanding) to 1 (unsatisfactory), with 4, 3, and 2 representing very good, average, and poor respectively. Supervisors of all engineering students (1827 respondents) over the period from Spring 2005 through Fall 2009 responded with an overall average rating of 4.17 across all questions. The most highly rated ABET outcome was the ability to use the techniques, skills, and modern tools necessary for accomplishing work in the profession (4.33). The lowest rated ABET outcome was the broad education necessary to understand the impact of their discipline on the world and society (4.05). For ISE students, the highest rated outcome was “Understanding of professional and ethical responsibility” (4.37) followed closely by “Ability to use the techniques, skills, and modern tools…” (4.36), whereas the
lowest for ISE students was the same as for all engineering students (4.00 for ISE). ISE students were rated on average 4.0 or above on every single rating, which means that our students are able to meet all of the outcomes at a very good or outstanding level. There were no poor or unsatisfactory ratings on average. Also, it is worthy to note that most of the co-op students are sophomores and juniors who would not be expected to meet all of the outcomes at a high level at that time in their academic career. Both survey instruments and the complete results will be available for review during the on-site visit.

As a side note, the co-op office obtained starting salary data for their co-op graduates. The average starting salary for the 430 Auburn engineers who participated in co-op was $50,504. Notably, ISE students who co-oped had an average starting salary of $53,349, which was the third highest behind Chemical Engineers ($55,262) and Wireless Engineers ($53,650).
CRITERION 4. CONTINUOUS IMPROVEMENT

A. Information Used for Program Improvement

Describe the available information, such as results from the Criteria 2 and 3 processes, commonly used in making decisions regarding program improvements.

The College of Engineering alumni and industry survey is conducted about every six years (most recently in 2009) and provides feedback primarily about our Program Educational Objectives. The results of the survey are analyzed by the department ABET leadership and then discussed with the faculty and Alumni Council for action or recommendation.

Alumni Council meetings provide invaluable input to the improvement process. The Alumni Council represents several of our key constituencies (students, alumni and employers). The Council is intimately involved with our program and serves both as an outside auditor of sorts as well as a problem-solving helpmate for our program. Summaries of these meetings and meeting minutes will be available for review at the on-site visit.

Detailed Outcome Metrics within Courses (discussed in the Criterion 3 section of the Self-Study) are used to measure outcomes at a very detailed and direct level in individual courses. These metrics are used by the instructors to improve their courses. For example, in ENGR 1110 (Introduction to Industrial and Systems Engineering), we do an assessment of Outcome (i), “a recognition of the need for, and an ability to engage in life-long learning”. We believe that if students attend a technical seminar, they will learn that it can be interesting and that they won’t be intimidated to attend an educational event outside their required classes. Students are given extra credit for attending a technical seminar at Auburn. The instructor publishes to the class announcements of seminars throughout the semester. Originally, students were required to get the speaker’s signature as proof of attendance. The instructor calculated the percentage of students who attended a seminar during the semester and believed that the percentage was low given that the students could receive extra credit. The instructor discovered through speaking with students that getting the signature of the speaker was often difficult and very intimidating for a freshman or sophomore student, as sometimes seminars had more than 100 attendees. The instructor changed the method of “proof” to having the student write a one-page summary of the speaker’s seminar. This increased the percentage of students who attend seminars as measured in later semesters and added a writing communication exercise. This is an example of using the assessment process to improve an outcome (closing the loop).

Senior Exit surveys are one of our most useful tools for improving the program. The data from the surveys is put into an Access data file for analysis. Issues of concern are brought to the attention of the faculty and Alumni Council for action.

Senior Exit interviews provide adult-to-adult time for the department chair to listen to the student’s perspective on his/her educational experience. Since the student is graduating, he/she feels free to share concerns and recommendations, and also to give accolades for a job well done.
Faculty meetings and retreats are our business meetings. It is during these important interactions that the faculty has the opportunity to work together on improving the department. Faculty meeting minutes/notes will be available for review during the on-site visit.

Co-Op supervisor evaluations are conducted annually by the University’s co-op program and results are shared with each academic department. The department ABET leadership analyze this data and share it with the faculty for action, if necessary.

Co-Op student evaluations are conducted annually as well by the co-op program. This data is also analyzed by the department and shared with the faculty for action, if necessary.

FE exam results are shared with the faculty semi-annually.

Ad-hoc conversations with constituencies are not formally documented but are certainly a valuable input to the process. A meeting with a student, a chance encounter with an alumnus at a football game, or a consulting job with a student’s co-op supervisor is an opportunity to discuss the department.

B. Actions to Improve the Program

Describe actions taken to improve the program since the last general review. Indicate why, i.e., the basis for taking action, and when each action was implemented and the results of the implementation.

Since our last evaluation in 2004, we have continuously improved our program based on input from our constituencies, just as we did prior to the 2004 visit. Continuous improvement is a focus of our department and is done every day as a natural part of our profession. Industrial Engineers by training are process oriented. We strive always to improve processes that are weak and fix processes that are broken. As stated before, we have not set “degrees of attainment” goals for each of the outcomes. We attempt to work on every deficit we uncover in our efforts to achieve outcomes. We expect every instructor to continuously improve performance of students in his/her courses, whether they are currently at the 70% level or the 95% level.

We pay attention to our peer institutions so that we are always using best practices. This is done by the Chair and other faculty visiting other departments, and by benchmarking with peers using information available on websites. We practice continuous improvement not because of ABET, but because we want our program to be “optimal” given the constraints that we have, analogous to any optimization problem that an IE might try to solve. The following specific actions have either been successfully implemented or are in process. Shown in parentheses after each action are the primary sources of information used as an impetus for this action.

1. In January, 2008, our department moved to the new state-of-the-art Shelby Center for Engineering and Technology, relocating from one of the least suitable buildings on campus to one of the most well suited. The new facility has tremendously improved the overall education experience of our students as well as the environment for faculty and staff. We now have five dedicated new
research labs: Occupational Safety and Ergonomics/Biomechanics, Energy Economics, Computational Systems, Automotive Manufacturing, and Logistics. We also have a dedicated Metrology Lab and a separate Manufacturing Processing Lab which can be used for either teaching or research. We are currently equipping a very large Manufacturing Systems Lab which we expect to have operational in 2011. We have spent over $500,000 so far in new updated lab equipment and facilities since our last review. We will pleased to show the ABET review team our laboratories and facilities. (Senior Exit Surveys, ABET PEV input, 2004)

2. Undergraduate enrollment has increased by 60% since 2004. This has ensured the viability of our program in the face of major budget cuts at our institution. Some of this increase is probably due to the new facilities which are very attractive to students. We also had a recruitment committee that was appointed by the faculty and the Alumni Council. We have increased our presence at all on-campus recruiting events to which we are invited at the recommendation of the committee. This action probably has also had a positive impact on enrollment. (Alumni Council, Faculty)

3. We have added Richard Sesek, Woojin Park, and Chase Murray to our faculty with the retirement of Saeed Maghsoodloo, Rob Thomas and Bob Bulfin and the resignation of Emmett Lodree. Some of our emeriti professors still teach in our program and advise students (J Black, Saeed Maghsoodloo, Rob Thomas). (Faculty)

4. We hired a full-time academic advisor in 2005 to advise our students. In the past, we had part-time advising or the advising was done by the general engineering advisors. The advisor has a bachelor’s and master’s degree in Industrial Engineering and 16 years experience as an IE in industry. The advisor serves as an advisor and mentor to the students. (Faculty, Benchmarking of other programs)

5. We have hired a new Director of Automotive Manufacturing Initiatives in 2010 to try to capitalize on the growth of the automotive manufacturing industry in the state of Alabama. This is a non-tenure stream faculty appointment. (Faculty Retreats)

6. We completed an internal departmental review in both 2006 and 2008 using the ABET self-study guidelines. These internal reviews help us to make sure that the continuous improvement effort is ongoing and is not just focused on the ABET visits every six years. These reviews will be available for the evaluation team to review during the on-site visit. (College Advisory Board)

7. We have made several curriculum changes for various reasons to improve the BISE program. These changes are documented in the Background section of this report as well as in table form in Appendix E. Every year, we review the documentation published by our institution in the AU Bulletin. We have submitted approximately 50 course change request documents over the six years to correct errors or make minor changes in courses to keep the documentation current. (Outcome metrics from various courses for Criterion 3, Faculty, Senior Exit Surveys, Curriculum Benchmarking, Alumni Council)
8. The department website is a crucial communication tool for all of our constituencies and has been enhanced and updated since 2004. It is changed on a regular basis to spark interest and provide the latest news and information about the changes and successful happenings in the department. The last comprehensive update was in Spring 2010. (College, Administration, Alumni, Students)

9. In an effort to increase our recognition among our peers and to learn best practices, we have hosted more than ten industrial engineering department heads from our peer universities to visit, give seminars, and exchange knowledge with our faculty and staff. This effort is on-going. (Faculty)

10. We started a publication *Report of Research and Scholarly Activities* in 2004 which details the accomplishments of our department every other year. These publications will be available during the on-site visit. (Faculty)

11. We have added an Automotive Engineering and Manufacturing minor for ISE and mechanical engineering students. This is designed to enhance their attractiveness to the burgeoning automotive business in the state of Alabama. We graduated our first ISE student with this minor in Spring 2010. (Faculty, Alumni Council, industrial contacts)

12. Because some faculty members were concerned about the academic quality of our graduates, specifically that a few students graduated with multiple Ds in major courses, a study was conducted looking back five years at student grades in different courses. The study was enlightening but there was no faculty agreement to make a change in our graduation requirements, which remain the same as for the College of Engineering. This requirement is that students must have a 2.0 overall GPA and a 2.0 in major GPA. (Faculty)

13. We created a departmental “Calculator Policy” that has been incorporated into all courses taught within our department. The policy, which is included in the course syllabi, limits the type of calculators that can be used for in-class exams and quizzes. (Senior Exit Surveys)

14. We have developed and added some new electives in response to changes in our profession and the needs and desires of our constituencies. These are in the subject areas of six-sigma quality control, automotive manufacturing, use of Excel and Access to solve operations problems, real options, AutoCAD, supply chain and logistics. (Senior Exit Surveys, Faculty)

15. During calendar year 2009 the tenure stream faculty published 21 refereed articles and book chapters and five books. We made 24 presentations at professional conferences or similar venues. (Institution, Faculty)

16. We expended a $400,000 NSF scholarship grant that was for ISE and ME students interested in automotive manufacturing. We have increased the departmental scholarship money available for our students substantially since 2004 with the advent of the Cook, Forehand, and Davis scholarships, among others. (Faculty)
17. Four new partially endowed professorships for ISE were established (Forehand Accenture, Breeden, Cook, and Forehand Leadership) and will be awarded in the coming years. (Alumni)

18. We conducted an NSF funded REU (Research Experience for Undergraduates) Site during the summers 2007, 2008 and 2009 for those interested in automotive manufacturing. Several of our students participated in the program and it also sparked an innovative student exchange program for the summer of 2009 between our department and Pukyong University in Busan, South Korea. (Faculty, Benchmarking)

19. We developed new brochures for our department, including an Undergraduate Program brochure, an Automotive Manufacturing and Engineering Minor brochure and an Internship and Co-op brochure. These are available for viewing during the on-site visit. (Faculty, Benchmarking)

20. We began implementation of a two year NSF-funded CCLI project to add computer programming applications to many of our undergraduate classes to enhance student use of computer programs in their future jobs. (Outcome metrics from INSY 3420, Criterion 3, Outcome e, Faculty, Employer ad-hoc input)

21. One of our staff members has become an ABET program evaluator which has strengthened our knowledge of assessment and continuous improvement. (Faculty)

22. We applied for an accelerated BISE/MISE program in April 2010 and hope to implement it in Fall 2010. This will allow our superior students to take credits during their senior year which will count for both their BISE and MISE degrees. (Institution, Benchmarking)

23. We have held a faculty retreat every summer since 2006. The retreats are used for strategic thinking and planning. Minutes of the faculty retreats will be available during the on-site visit. Focus areas over the last six years have included:
   a. What does a successful INSY program look like and how do we measure it?
   b. Do we need to make the requirements for graduation from our program more challenging?
   c. How do we improve our ranking among our peers?
   d. Should we pursue an Automotive Manufacturing Research Center?
   e. General Curriculum Review including considering Major Tracks, improving communication skills, alternative computer courses, change in Senior Design, adding lean/six-sigma to required courses, creating a two-course manufacturing sequence, etc. Some of these issues are still under consideration, some have been implemented and some have been discarded.
   f. Department policies such as use of calculators (which type) during tests and how to ensure academic honesty.
   g. How do we improve the senior design experience for students and instructors and host organizations?
h. Development of “Starts, Stops, Continues” strategy for long term planning.
i. What is our department known for and what do we want it to be known for?
j. Discussion of student work ethic.
CRITERION 5. CURRICULUM

A. Program Curriculum

1. Describe how students are prepared for a professional career and further study in the discipline through the curriculum and indicate how the curriculum is consistent with the Program Educational Objectives and Program Outcomes.

The BISE curriculum is 126 semester credit hours and is designed to be accomplished in eight semesters (see Appendix E) although most students take courses in the summer or take an extra semester during their 5th year to reduce the number of credit hours they have to take during a single semester. There is a strong grounding in mathematics (five courses), the basic sciences (three courses with labs), and statistics (two courses and a lab). As technical complements, there are two courses in computer programming, a course of electrical engineering, a course in material science, and a required engineering elective, usually either statics or mechanics. Students must also complete the Auburn University “Core” (30 credit hours), which is an institution requirement. The “Core” consists of two courses in English composition, two courses in literature, two sequenced courses in history, one fine arts course, two social science courses, and a course in ethics. Auburn’s core curriculum complements the technical content of the curriculum very well. The two English composition courses teach the students writing skills which can later be applied to technical writing required in many of their engineering courses. In addition, the English department offers various sections of these courses with specific emphasis in selected topics, such as “Women in Science and Engineering”, “Greenhouse”, “Forestry and Wildlife Sciences”, “Cultural Diversity”, etc., so that a student has the opportunity to tailor his/her writing courses toward his/her field of study or area of interest. Students in engineering are also encouraged to take the “Technology and Civilization” sequence for their two history core classes. These classes teach history with emphasis placed on the role of technology in the development of people and nations. The two world literature courses are designed to give students a perspective for other cultures and societies around the globe. The fine arts courses offered are in the areas of theater, music, art history, and architecture. Any one of these choices would enrich a student’s general education. In addition, some engineering students specifically choose one of these because they have some interest in pursing an engineering career in one of these non-traditional fields. As for the two social sciences, there are two different groups; students must choose one course from each group. In group I, students may choose microeconomics, American government, or political economy. Most engineering students choose microeconomics, because they plan to work in a commercial enterprise where understanding supply/demand, the role of government, and the globalization of markets are crucial to success. In group II, they may choose anthropology, sociology, psychology, or geography. Many ISE students take psychology because they will be working with teams of people and they will most likely supervise others if they follow the typical industrial engineering career path. Most ISE students take business ethics, which helps them to understand how to behave ethically in the workplace and how to avoid ethical pitfalls.
There are two required introductory engineering courses intended for freshman year. The first, ENGR 1100 (Engineering Orientation), is a seminar type course that exposes students to all the engineering majors as well as engineering services and opportunities such as tutoring, cooperative education, and study abroad. The second course is ENGR 1110 (Introduction to Engineering), taught by all of the engineering departments. ISE normally offers six sections in the fall semester and four sections in the spring semester, teaching approximately 120 and 80 students, respectively each semester. Many students choose ISE after being exposed to the major in ENGR 1100 or ENGR 1110.

Within the ISE component of the curriculum are courses in all ISE core competencies – safety and ergonomics, work measurement, deterministic operations research, stochastic operations research, manufacturing processes, simulation, operations planning, engineering economics, quality control and manufacturing systems. There is also a one credit hour required Professional Practice course which is designed to help prepare students to enter the work force. There is also a three credit hour Senior Design course. Within the ISE courses, lab work is an important component. Each of the following courses has a 2.5 hour weekly lab as part of the course: INSY 3021 (Methods Engineering and Work Measurement), INSY 3410 (Deterministic Operations Research), INSY 3800 (Manufacturing Processes), INSY 3420 (Simulation), INSY 3700 (Operations Planning), and STAT 3611 (Probability and Statistics II). This enables students to use modern engineering tools on projects and experiments, and provides ample “hands on” experience. Often, the lab work is conducted in small groups. INSY 4800 (Senior Design) is designated fully as 7.5 lab hours – dominantly field work at the industrial partner.

A student must take two courses (3 credit hours each) of ISE electives and one course (3 credit hours) of technical elective. The latter can be another ISE course, or be chosen from a set of courses offered by other engineering departments. The allowed electives document is shown in Appendix E and on our website. Current ISE electives are INSY 5010 (Safety Engineering I), INSY 4970 (Safety Engineering II), INSY 5240 (Production and Inventory Control Systems), INSY 5250 (Scheduling and Project Management), INSY 5330 (Six-Sigma), INSY 5500 (Information Technology for Operations), INSY 5550 (Decision Support Systems for Operations), INY 5600 (Manufacturing and Production Economics), INSY 5630 (Real Options and Decision Analysis), INSY 5800 (Lean Production), INSY 5830 (Vehicle Technology and Trends), INSY 5840 (Control of the Manufacturing Floor and Processes), INSY 5850 (Electronics Manufacturing Systems), and INSY 5860 (Automotive Manufacturing Systems). New electives are developed by faculty reflecting their interest and new technologies emerging in the field of Industrial and Systems Engineering. The electives vary by semester; usually four to five are offered each semester, except in the summer.

The department offers a minor in Automotive Manufacturing and Engineering, which consists of 15 hours of elective courses in this area. We graduated our first ISE student with the minor in Spring 2010. Some of our students also receive a minor in Business Engineering Technology (BET) and many receive a minor in Business Administration.
2. Provide evidence that the minimum credit hours and distribution, as specified in Criterion 5, are met. Complete and include Table 5.1.

Table 5.1 is shown below. Our curriculum exceeds both the minimum semester credit hour criteria as well as the minimum percentage criteria for both Math & Basic Sciences and for Engineering Topics. Please note below in Year: Semester SR2, we require an “ENGR Elective or ROTC” and a “TECH Elective or ROTC or BET”. As discussed earlier, students must take an ENGR elective (3 hours) as part of the curriculum. The choice of ENGR electives is shown as part of Appendix E and consists of these courses: ENGR 2050 (Statics), ENGR 2200 (Thermodynamics, Fluids, and Heat Transfer), ENGR 2100 (Mechanics), and MECH 2110 (Statics and Dynamics). However, students who are in ROTC may substitute three hours of earned ROTC credit for the ENGR elective. In addition, as discussed earlier, students must take a TECH elective (3 hours). The choice of TECH electives is also shown as part of Appendix E and consists of either any INSY course not required for major or a list of courses that are approved from other majors. However, students who are in ROTC may substitute three hours of earned ROTC credit for the TECH elective and students who are in the Business-Engineering-Technology (BET) minor program may also substitute three hours of earned BET credit for the TECH elective.

In the case of an ROTC student, Table 5.1 would be slightly different. The three hours of ENGR Elective and the three hours of TECH Elective would be moved to the “Other” category. A graduating ROTC student would therefore have 39 hours Math and Science (31%), 51 hours of Engineering (40.4%), 30 hours of General Education (23.8%), and 6 hours of Other (4.8%). This distribution of hours still exceeds the ABET minimums for both semester hours and percentages.

In the case of a BET student, Table 5.1 would also be slightly different. Three hours of TECH Elective would be moved to the “Other” category. Therefore, a graduating BET student would have 39 hours Math and Science (31%), 54 hours of Engineering (42.9%), 30 hours of General Education (23.8%), and 3 hours of Other (2.4%). This distribution of hours still exceeds the ABET minimums for both semester hours and percentages.

The majority of our students have the distribution of hours as shown below, whereas approximately 10% of our students are ROTC or BET and have the distribution of hours as described above upon graduation from our program.
<table>
<thead>
<tr>
<th>Year; Semester or Quarter</th>
<th>Course (Department, Number, Title)</th>
<th>Math &amp; Basic Sciences</th>
<th>Category (Credit Hours)</th>
<th>Engineering Topics Contains Significant Design (✓)</th>
<th>General Education</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FR 1</strong></td>
<td>MATH 1610 Calculus I</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHEM 1030 Fund Chemistry I</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHEM 1031 Fund Chemistry I Lab</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGL 1100 English Comp. I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGR 1110 Intro. To Engr.</td>
<td>2(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HIST 1210 Tech. &amp; Civ. I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGR 1100 Engr. Orientation</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FR 2</strong></td>
<td>MATH 1620 Calculus II</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYS 1600 Engr. Physics I &amp; Lab</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGL 1120 English Comp. II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core History I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMP 1200 Intro. Comp. Programming (Matlab)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SO 1</strong></td>
<td>PHYS 1610 Engr. Physics II &amp; Lab</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGL 2200 World Literature I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 2630 Calculus III</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 2650 Linear Diff. Eq.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>STAT 3600 Prob. &amp; Stat. I</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SO 2</strong></td>
<td>MATH 2660 Top. Linear Alg.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>STAT 3610 Prob. &amp; Stat. II</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>STAT 3611 Prob. &amp; Stat. II Lab</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 3020 Occupational Safety &amp; Ergo.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 3021 Methods Eng. &amp; Meas.</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATL 2100 Intro Material Science</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>JR 1</strong></td>
<td>Social Science I</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMP 3010 Fund of Computing I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 3400 Stochastic OR</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 3410 Deterministic OR</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 3800 Manuf. Processes</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>JR 2</strong></td>
<td>INSY 3600 Engr. Econ. Analysis</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGL 2210 Great Books II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social Science II</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 3420 Simulation</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 3700 Operations Plan.</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SR 1</strong></td>
<td>INSY 4500 Prof. Practice</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ethics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ELEC 3810 Fund. Elec. Engr.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 4330 Quality Control</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY 4700 Manuf. Sys.</td>
<td>3(✓)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY Elective</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SR 2</strong></td>
<td>INSY 4800 Senior Design</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INSY Elective</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fine Arts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGR Elective or ROTC</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TECH Elective or ROTC or BET</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTALS-ABET BASIC-LEVEL REQUIREMENTS</strong></td>
<td>39</td>
<td>57</td>
<td>30</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OVERALL TOTAL FOR DEGREE** | **126** |

**PERCENT OF TOTAL**
- Minimum semester credit hours: Minimum percentage: 31.0% 45.2% 23.8% 0%
- Minimum semester credit hours: Minimum percentage: 32 hrs 48 hrs 37.5%
3. Describe the culminating major design experience, including how it is based on the knowledge and skills acquired in earlier course work and how appropriate engineering standards and multiple realistic constraints are incorporated in the experience.

Our culminating major design experience is accomplished in our three-semester hour course INSY 4800 (Senior Design), which is taken by students in Spring semester of senior year. All of our seniors participate in a real-world project at a local company or non-profit organization. These projects are typical of open ended projects a new professional industrial engineer would encounter in the first years on the job. One of the faculty members serves as the course instructor. The instructor assignment is rotated among the faculty. The instructor helps the students divide into groups of three to four and then assigns a faculty advisor and a company. Projects may be loosely defined or undefined at the start of the semester, but the company and contact are vetted by the instructor or advisor beforehand. We ensure that the students enrolled in Senior Design have the knowledge and skills acquired in earlier course work through enforcement of pre-requisites. Students must have already taken INSY 3021 (Methods and Work Measurement) and INSY 4700 (Manufacturing Systems). Furthermore, INSY 4700 requires the successful completion of INSY 3420 (Simulation), INSY 3700 (Operations Planning), and INSY 3600 (Engineering Economics). INSY 3420 requires COMP 3010 (Spreadsheet-based Applications), INSY 3400 (Stochastic O.R.), and STAT 3610 (Prob. and Stat. II), while INSY 3700 requires INSY 3400 (Stochastic O.R.), INSY 3410 (Deterministic O.R.), and STAT 3610 (Prob. and Stat. II).

The Senior Design projects vary greatly within and between semesters. We require that the sites are located within one hour’s drive of campus. For example, in Spring of 2010, the projects were located at Salvation Army (Auburn), Hager Hinge (Montgomery), GKN-Aerospace (Auburn), AFLAC (Columbus), CSP Technologies (Auburn), Neptune (Tallassee), St. Francis Hospital (Columbus), CoachComm (Auburn), and Briggs and Stratton (Auburn). The students are required to define the project with the company contact and present a proposal to the course instructor, faculty advisor and other faculty members. During the proposal stage, the faculty evaluates whether the project as defined is appropriate for a senior design project. They also give input at this time if the relevant engineering standards, methods and constraints are being considered. Since the projects vary so much, each one is treated individually by the instructor, advisor and team. Methods, approaches, standards and constraints vary widely across the projects. For example, in the Spring 2010 project conducted at one of the project sites, combustible dust was a problem. In that case, the students had to investigate the OSHA standards for combustible dust. Some of the projects required use of AutoCAD drawings, requiring students to understand engineering drawing standards. In the case of constraints, all of the projects have time constraints because the project must be completed during the semester. Financial constraints also exist to some degree for projects; for example, one of the Spring 2010 projects, the Salvation Army (a non-profit agency), has very limited financial means to execute the students’ recommendation. The students actually created clothes sorting pictorial aids and gave them to the client as part of the project. Many of the companies had floor space, equipment, tooling, labor, and production scheduling constraints. The course instructor and project advisor continually monitor and evaluate the students’ project work, ensuring that the project provides a real-
world experience for the students using some or all of the industrial engineering techniques learned by the students in their coursework.

In addition to the oral and written project proposal, the students must submit an oral and written final report as well as develop and give a poster presentation. The students are also required to present the project findings to their company contact(s). Final written reports for each semester are bound and kept in the permanent ISE library in Shelby Center and will be available for review by the evaluator during the on-site visit.

4. Demonstrate that adequate time and attention are given to each curricular component, consistent with the outcomes and objectives of the program and the institution.

As stated previously and as shown in Table 5.1, our curriculum exceeds both the ABET minimum semester credit hour criteria as well as the minimum percentage criteria. Moreover, Figures 3.2 and 3.3 in the Outcomes Section of this report show a relationship between all of the courses in the curriculum and both the outcomes and the objectives of our program. Through our outcomes assessment process, used in all of our required courses, we ensure that the courses are delivering the desired outcomes. Therefore we have connection from measurement and assessment at a detailed level within courses to outcomes and objectives of the program. We believe that we have all the required assessments in place to contribute to our institution’s strategic plan in academics, which is to “Elevate academics and enrich the undergraduate experience.”

5. Describe the provisions for any cooperative education that is used to satisfy curricular requirements.

While cooperative education is considered important to a student’s educational experience and provides extensive experiential education, it is not required by our program. If a student does co op, course credit is not given for that experience.

6. Describe the additional materials that will be available for review during the visit to demonstrate achievement related to this criterion, per section II.E.3.c of the ABET Accreditation Policy and Procedure Manual (APPM).

The following list of materials will be available for review during the on-site ABET visit:

- Multiple course books for each course with syllabi, assessment results, and samples of student work.
- Outcomes (a-m) books.
- Textbooks used in various courses.
- Senior Design project material.
- Alumni Council Minutes.
- Faculty Meeting and Retreat Minutes.
- Program brochures
B. Prerequisite Flow Chart

Attach a flow chart showing the prerequisite structure of the program’s courses required or allowed towards the major.

Figure 5-1 Industrial and Systems Engineering Curriculum Flow Chart
**C. Course Syllabi**

In Appendix A, include a syllabus for each course used to satisfy the mathematics, science, and discipline-specific requirements required by Criterion 5 or any applicable Program Criteria. The syllabi format should be consistent for each course, must not exceed two pages per course, and, at a minimum, contain the following information:

- Department, course number, and title of course
- Designation as a Required or Elective course
- Course (catalog) description
- Prerequisites
- Textbook(s) and/or other required material
- Course learning outcomes
- Topics covered
- Class/laboratory schedule, i.e., number of sessions each week and duration of each session
- Contribution of course to meeting the requirements of Criterion 5
- Relationship of course to Program Outcomes
- Person(s) who prepared this description and date of preparation

The course syllabi included in Appendix A include all of the courses taught by our department. The courses that are used to satisfy the mathematics and science requirements for our program that are not taught by our department are: MATH 1610 (Calculus I), 1620 (Calculus II), 2630 (Calculus III), 2650 (Differential Equations), 2660 (Linear Algebra), CHEM 1030 (Fundamentals of Chemistry), 1031 (Fundamentals of Chemistry Lab), PHYS 1600 (Physics I), 1610 (Physics II). These syllabi are available in the college’s report and will be available for our evaluator to review during the on-site visit.

Included below is Table 5.2 as requested in the Self-Study Questionnaire. The responsible faculty member may change from year to year for certain courses. The math department offers additional sections of STAT 3600, 3610 and 3611, and these are included in the table for Dr. Maghsoodloo even though he does not teach all of the sections. The percentages shown are based on the credit hour distribution for lecture/lab. For example, INSY 3021 (Methods and Work Measurement) is a 3 credit hour course with 2 hours of lecture and 3 hours of lab. However, the credit given for the course is 3 total hours, 1 credit for each hour of lecture (2 total) and 1 credit for each 3 hours of lab.
Therefore, the percentage of credit is \( \frac{2}{3} (67\%) \) for lecture and \( \frac{1}{3} (33\%) \) for lab.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Title</th>
<th>Responsible Faculty Member</th>
<th>No. of Sections Offered in 09-10</th>
<th>Avg. Section Enrollment</th>
<th>Lecture</th>
<th>Lab</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 1110</td>
<td>Intro to ISE</td>
<td>Sims</td>
<td>11</td>
<td>20</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>STAT 3600</td>
<td>Prob &amp; Stat I</td>
<td>Maghsoodloo</td>
<td>6</td>
<td>40</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3610</td>
<td>Prob &amp; Stat II</td>
<td>Maghsoodloo</td>
<td>3</td>
<td>30</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3611</td>
<td>Prob &amp; Stat II Lab</td>
<td>Maghsoodloo</td>
<td>3</td>
<td>20</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>INSY 3020</td>
<td>Safety &amp; Ergo</td>
<td>Thomas</td>
<td>1</td>
<td>70</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3021</td>
<td>Methods &amp; Work Meas</td>
<td>Davis</td>
<td>3</td>
<td>20</td>
<td>67%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>INSY 3400</td>
<td>Stochastic O.R.</td>
<td>Gue</td>
<td>1</td>
<td>50</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3410</td>
<td>Deterministic O.R.</td>
<td>Valenzuela</td>
<td>2</td>
<td>25</td>
<td>67%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>INSY 3420</td>
<td>Simulation</td>
<td>J. Smith</td>
<td>2</td>
<td>25</td>
<td>67%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>INSY 3600</td>
<td>Engineering Economics</td>
<td>C. Park</td>
<td>5</td>
<td>75</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 3700</td>
<td>Operations Planning</td>
<td>Gue</td>
<td>1</td>
<td>40</td>
<td>67%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>INSY 3800</td>
<td>Manf Processes</td>
<td>Payton</td>
<td>3</td>
<td>15</td>
<td>67%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>INSY 4330</td>
<td>Quality Control</td>
<td>A. Smith</td>
<td>1</td>
<td>50</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSY 4500</td>
<td>Professional Practice</td>
<td>Davis</td>
<td>1</td>
<td>50</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CRITERION 6. FACULTY

A. Leadership Responsibilities

Identify the person who has leadership responsibilities for the program. Describe the leadership and management responsibilities of that person.

Professor Alice Smith is the chair of the department and is responsible for all aspects of leadership and management of the department. She works with the faculty, the Dean of the College of Engineering, other department heads or chairs, and the Faculty Senate to ensure program excellence.

B. Authority and Responsibility of Faculty

Describe the role played by the program faculty with respect to course creation, modification, and evaluation. Describe the roles played by others on the campus, e.g., Dean’s Office, Provost’s Office, with respect to these areas. Describe the process used to ensure consistency and quality of the courses taught.

The program faculty gathers input from all of the constituencies as documented in other parts of this document. They are responsible for course creation, modification, and evaluation. The course descriptions as written by the program faculty and approved by the institution are maintained in the Auburn Bulletin (course catalog) along with the list of pre-requisites, co-requisites, lecture hours and lab hours. Modifications to the Bulletin content must be originated by a faculty on a form required by the institution (“Proposal Form for Addition and Revision of Courses”), signed by the Department Chair, signed by the Associate Dean of the college, and then approved by the University Curriculum Committee, which is appointed by the Provost.

Changes to courses that do not affect the Bulletin can be made by the instructor as he or she sees fit. Instructors use many different inputs, experiences and expertise to determine course content, such as input from other faculty members who teach related courses, data from the outcomes assessment process, student input given in the course evaluations, or in response to changes in knowledge or technology in the subject area. Instructors are expected to make whatever changes are needed to continuously improve the courses for our students.

Our faculty members frequently discuss any weaknesses are seen in student performance in our courses. Then, changes are made to the courses that feed to the courses where the weaknesses are seen. If the weaknesses are resulting from courses outside our major, we work with other departments to improve student performance.
C. Faculty

Describe the composition, size, credentials, experience, and workload of the faculty that supports this program. Complete and include Tables 6.1 and 6.2.

We currently (May 15, 2010) have a tenure stream faculty size of nine with one new member joining us in Fall 2010 to bring us to ten. All of the faculty members hold a terminal (Ph.D.) degree in industrial engineering or a very closely aligned field (engineering management, statistics) from a United States institution. During the most recent academic year, 2009-2010, we employed nine part-time instructors with all but three of them holding terminal degrees. These three hold masters degrees in industrial engineering or related fields, two have a significant number of years of industry experience and are in our PhD program, and one is an advanced PhD student in our program.

D. Faculty Competencies

Describe the competencies of the faculty and how they are adequate to cover all of the curricular areas of the program.

The ISE faculty members are extremely well qualified by virtue of education and professional experience. They have had sustained industry experience and interaction. They are, without exception, active scholars with multiple referenced publications each year and one or more on-going sponsored projects (research grants). They are involved with professional societies, publications, conferences and reviewing. They also supervise one or more graduate students as primary advisor.

We match faculty special interests and abilities to courses, so that every course in our curriculum is basically taught by a specialist. Some of the courses are rotated among the faculty if there are multiple faculty members who are interested in that particular topic.

E. Faculty Size

Discuss the adequacy of the size of the faculty and describe the extent and quality of faculty involvement in interactions with students, student advising, service activities, and professional development.

The faculty size, supplemented by part-time qualified instructors, is adequate for teaching our required courses at least once per year as well as the electives that we offer each semester. However, the growth of our student body, both at the undergraduate and the graduate levels, without growth of the faculty has stretched faculty resources very thin.

Our faculty members either have open-door policies or post office hours during which they are available to students. We have a professional academic advisor who advises all undergraduate students in the department; however faculty members are available for advising as well. All of our faculty members participate in service and professional development activities as documented elsewhere.

Nearly all full time faculty members are members of the Institute of Industrial Engineers (IIE). Drs. Black, C. Park, J. Smith and A. Smith are Fellows of IIE. Dr. Gue, Dr.
Thomas, and Ms. Sims are Senior Members of IIE. Ms. Sims is the current IIE Student Chapter Faculty Advisor as well as the Southeast Region Vice President.

The department has an active Alpha Pi Mu chapter which typically inducts about twenty students each spring. Dr. Gue is the Faculty Advisor to this group. Student chapters of the American Society of Safety Engineers (ASSE) and the Human Factors and Ergonomics Society (HFES) are currently in the process of being formed under the leadership of Drs. Davis and Sesek.

Dr. C. Park is the past Editor in Chief of *The Engineering Economist*. Dr. A. Smith serves on the editorial board of *INFORMS Journal on Computing, Computers & Operations Research* and *IEEE Transactions on Evolutionary Computation*. Dr. Black, Society of Manufacturing Engineers (SMfE) Fellow, is the past Editor in Chief of *Journal of Manufacturing Systems*. Dr. Black is also a fellow of the American Society of Mechanical Engineers (ASME). Dr. Black was the founding editor of the *Journal of Manufacturing Processes* for SMfE and was the associate editor for ASME transactions. Dr. Gue is on the editorial board of *Naval Research Logistics*. He is also an Academic Liaison to the Board of Governors of the Material Handling Industry of America. Dr. J. Smith serves as President of the College Industry Council on Material Handling Education for the Material Handling Institute and is also on the editorial board of *Simulation, Transactions of the Society for Modeling and Simulation International*. Dr. Davis serves on the Board of Directors of IIE’s Society for Work Science and is editor of the SWS Newsletter. Dr. Thomas is a member of the Steering Group of the Ergonomics Committee of the American Industrial Hygiene Association (AIHA). Many full time faculty members have served as panel and/or site reviewers for the National Science Foundation (NSF) or National Institute of Occupational Safety and Health (NIOSH). Dr. Payton is a member of the Society of Manufacturing Engineers (SME) and ASME.

Drs. Maghsoodloo, C. Park, A. Smith and Thomas are registered Professional Engineers (PEs) in industrial engineering. Drs. Thomas, Davis and Sesek are Certified Professional Ergonomists (CPEs) and Dr. Davis and Dr. Sesek are Certified Safety Professionals (CSPs).

Every full time faculty member has spent time in either industry or government as a full time employee during his or her career. Organizations include U.S. Navy, U.S. Army, Southwestern Bell and DaimlerChrysler. Additionally, several of the part time faculty members have extensive industry experience.

We have many avenues of collaboration with industry including Senior Design projects, Masters projects, sponsored research projects, consulting, outreach through the university, outreach through the NIOSH center and interaction with distance learning MISE students (who are all working professionals). We also have a rather unique opportunity for faculty and student interaction with industry and this is through the National Science Foundation Industrial / University Cooperative Research Center for Advanced Vehicle Electronics (CAVE).
F. Faculty

In Appendix B include an abbreviated resume for each program faculty member with the rank of instructor or above. The format should be consistent for each resume, must not exceed two pages per person, and, at a minimum, must contain the following information:

- Name and academic rank
- Degrees with fields, institution, and date
- Number of years of service on this faculty, including date of original appointment and dates of advancement in rank
- Other related experience, i.e., teaching, industrial, etc.
- Consulting, patents, etc.
- States in which professionally licensed or certified, if applicable
- Principal publications of the last five years
- Scientific and professional societies of which a member
- Honors and awards
- Institutional and professional service in the last five years
- Percentage of time available for research or scholarly activities
- Percentage of time committed to the program

G. Faculty Development

Describe the plan that is in place for faculty development and the funding available to execute this plan. Provide detailed descriptions of professional development activities for each faculty member.

Faculty members are supported in several ways for professional development. The university offers a number of classes at no charge (generally ½ day) on specific topics such as oral presentation, supervising student workers and listening skills.

Travel to professional conferences is included in faculty start up packages (funded by the department) and the department sometimes sponsors faculty members to attend conferences beyond their start up period (this comes from the O&M portion of the budget discussed in Criterion 8).

Sabbatical leave is offered per the university guidelines. During the 2009-10 academic year, Dr. Jorge Valenzuela was on sabbatical.

Release time from teaching is offered when possible for faculty members nearing promotion or faculty members with short term extensive service activities. This is funded by the department. Within the past several years, Dr. Jeff Smith was given one term of release time from one class for his role as Graduate Program Director.
New faculty members take part in a one year development program that is University wide. Newer faculty members are also mentored informally by the more senior members of the faculty. Every year the full professors review the C.V.s of the non full professors and provide feedback to each of these regarding their progress towards promotion (and tenure if applicable). Instructors are mentored by the department faculty and also advised to seek teaching advice from the Auburn University Biggio Center. Teaching assistants attend a University wide orientation and workshop annually. Teaching assistants are also reviewed orally by the faculty twice a year.
CRITERION 7. FACILITIES

A. Space

Summarize the availability of program facilities and indicate how adequate they are for supporting the educational objectives and outcomes of the program. Discuss the following.

In December 2007, we moved to the newly built Shelby Center for Engineering Technology. We moved from one of the poorest buildings on campus (Dunstan Hall built circa 1950) to one of the best. Our department worked closely with the designers and architects of the new building to ensure this new facility would fully satisfy both our current and future needs. We are able to teach almost all of our classes and house most of our labs in Shelby. All of our full-time faculty and staff and most of our graduate students are housed on the third floor, west wing of Shelby. This facility offers a world-class place for us to teach and conduct research.

Along with the offices, laboratories and classrooms described below we have a large student lounge / study room which is shared with the students of the Computer Science and Computer Engineering Department. We also have a small quiet study room with carrels for students. We have an open ISE computer laboratory which has 30 networked PCs, a network printer and a copier. These rooms along with rooms 3210 and 3205 (described below) are available 24/7 to ISE students by swiping their student ID card.
1. *Offices (Administrative, Faculty, Clerical, Teaching Assistants)*

All faculty and staff have offices on the third floor of the west wing of Shelby. Our proximity to each other has greatly enhanced our already congenial departmental relationships. Faculty and staff members often informally meet and have lunch together. Faculty offices range from 141 square feet to 372 square feet. All of the administrative employees have private offices except for the department receptionist. We have both a large (32 chairs) and small (10 chairs) conference room, both equipped with smart boards and computer integrated projection equipment. We also have a break room with refrigerator and microwave. The layout of our primary space on the Shelby 3rd floor is:

![Figure 7.2 Transportation Technology Center Third Floor West](image)

Our graduate students have state-of-the-art offices. They are organized into “pods” primarily by area of interest. The Occupational Safety & Ergonomics graduate office holds 37 students; the Electrical Power Systems office holds 8 students; the Computation office holds 8 students; the Electronics Manufacturing office holds 9 students; the Logistics office holds 6 students; there are two “open” villages holding 37 and 22 students. Because of our burgeoning graduate student population, we had to “borrow”...
some space from the Computer Science and Computer Engineering Department, and now we have one pod on the 2nd floor of Shelby holding 20 students. These pods afford comfortable space for undergraduate students to meet with their graduate teaching assistants (TAs).

2. Classrooms
The department teaches most lecture classes in Shelby Center 1st floor, east wing, in rooms 1103 (172 seats), 1120 (58 seats), 1122 (58 seats), 1124 (57 seats), and 1126 (64 seats). All of these theater-style classrooms have state-of-the-art teaching equipment including computer controlled projectors, screens, window blinds and lighting. In addition, room 1120 is equipped for recording lectures and is used for our outreach courses. Some of the undergraduate courses are joint listed with their graduate level outreach counterpart (so called “piggy back courses”) and are taught in this room.

![Figure 7.3 Typical Classroom, Shelby Center, 1st Floor](image)

We also have a seminar room 3210 on the 3rd floor, center building of Shelby, which has 60 seats. We can use this room if needed for teaching; it is equipped with a computer and projector as well, but is not theater-style. We primarily use this room for large meetings or presentations that occur at different times during the semester.

We have a computer teaching lab Shelby 3205 on the 3rd floor, center building of Shelby which has 40 computer stations. Almost all of our courses that have a lab component are taught in this classroom, which has smart board and Senteo (a student interactive response system) technology, as well as computer controlled projection.

Since classrooms in Shelby are shared with other departments within Auburn, occasionally we have to schedule classes in other buildings such as Ramsay Hall, Haley Center or Broun Hall.

3. Laboratories
There are currently four main types of laboratories in the department: First, the computer teaching lab and open lab are described in Section B.1 below. Photos of these labs are shown in Appendix C. The second type is a group of labs that are used to teach our
course INSY 3800 (Manufacturing Processes) as well as for research. This second type includes the Design and Manufacturing Laboratory (shared jointly with Mechanical Engineering), the Metrology Laboratory and Basic Computer Numerical Control Laboratory. These labs allow students to have a “hands on” experience with the basic measuring tools of industry as well as with fundamental machining principles. Photos of the equipment in these labs and description of the equipment is shown in Appendix C. The third type is the occupational safety and ergonomics (OSE) labs which consist of the OSE/IP (Injury Prevention) Library, the Biomechanics Lab, and the Human Factors Engineering (formerly Ergonomics/Safety) Laboratory. Photos and detailed descriptions of these labs are shown in Appendix C. The fourth and final lab type is the Electronics Manufacturing Lab, which is located in Broun Hall, and shared with electrical and mechanical engineering. Photos and detailed descriptions of these labs are shown in Appendix C.

We include here more detail about one of the labs included in the second type referred to previously, the Design and Manufacturing Laboratory (DML). The DML is a fully functional modern machine shop including manual drill presses, vertical and horizontal milling machines, vertical and horizontal saws and large machine lathes along with sheet metal and welding equipment. The laboratory also has several computer numerically controlled lathes and mills. A full metrology and layout area is included along with the ability to do heat treatment, casting and forging work.

B. Resources and Support

1. Describe the computing resources, hardware and software used for instruction. Specify any limitations that impact the student’s ability to achieve the program’s outcomes and the faculty’s teaching and scholarly activities.

The institution has computer labs throughout the campus and the college has computer labs throughout the various engineering buildings available for student use. There is free wireless internet service campus wide. However, most of the ISE students use the ISE computer labs on the 3rd floor of Shelby, which are the focus of this report.

The ISE computer labs include a “teaching lab”, Shelby 3205, with 40 student stations, one instruction station, and a ceiling-mounted projection systems and an “open lab”, Shelby 3322 that includes 30 student stations. The computers, printers, and network components are managed and maintained by the College of Engineering’s Engineering Network Services group. The labs both have card-swipe door locks and are available for student and classroom use 24 hours/day. The systems in both labs are very similar. The specifications for the majority of the systems are given below (the minor differences in configurations come primarily from repairs).

<table>
<thead>
<tr>
<th>Model</th>
<th>Dell Optiplex 755</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Core Duo 2.00 GHz</td>
</tr>
<tr>
<td>RAM</td>
<td>2 GB</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>160 GB</td>
</tr>
</tbody>
</table>
The following software is currently installed on the systems in the ISE computer labs.

<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ansys 11.0</td>
<td>Computer-aided engineering technology and engineering design analysis software</td>
</tr>
<tr>
<td>AutoDesk</td>
<td>Visualize, simulate, and analyze the real-world</td>
</tr>
<tr>
<td>jGrasp</td>
<td>IDE (integrated development environment) supporting Java and C++ development.</td>
</tr>
<tr>
<td>BestFit</td>
<td>Statistical distribution-fitting and analysis package</td>
</tr>
<tr>
<td>@ Risk</td>
<td>Monte-Carlo simulation package</td>
</tr>
<tr>
<td>Arena</td>
<td>Simulation package</td>
</tr>
<tr>
<td>Minitab 15</td>
<td>Statistical analysis software</td>
</tr>
<tr>
<td>Lingo 11.0</td>
<td>Mathematical programming language and solver</td>
</tr>
<tr>
<td>AMPL</td>
<td>Mathematical programming language</td>
</tr>
<tr>
<td>Maple 10.0</td>
<td>Mathematical analysis package</td>
</tr>
<tr>
<td>Matlab R2009A</td>
<td>Mathematical analysis package/programming language</td>
</tr>
<tr>
<td>SolidEdge ST</td>
<td>Computer-aided design (CAD) package</td>
</tr>
<tr>
<td>Spss 16.0</td>
<td>Statistical analysis package</td>
</tr>
<tr>
<td>MasterCAM X3</td>
<td>Computer-aided manufacturing/NC code generation software package</td>
</tr>
<tr>
<td>Cygwin</td>
<td>Unix-style toolkit</td>
</tr>
<tr>
<td>JAWS</td>
<td>Text-to-speech software for blind or visually impaired individuals</td>
</tr>
<tr>
<td>Microsoft Office</td>
<td>Office productivity suite</td>
</tr>
</tbody>
</table>

There are no known computing resource limitations impacting students or faculty. Photos of the two ISE computer labs are shown in Appendix C.

2. Describe the laboratory equipment planning, acquisition, and maintenance processes and their adequacy.

Budgeting for laboratory equipment is done each year based on faculty needs and plans. Faculty usually research what type of equipment they need and originate the paperwork for the purchase, which is routed through Auburn’s procurement process like any other purchase. When we moved into the Shelby Center we upgraded all of the computing
equipment and much of our other equipment. We had saved for years for the move and were able to resource the purchases without issue.

Maintenance is somewhat problematic. Engineering Network Services maintains the network and the laboratory computers and software. We also have a half time (20 hours per week) graduate student to investigate any computer or software problems, fix them if he is able, and refer the rest to Engineering Network Services. However, for the other equipment (not computing) our maintenance is more ad hoc. We sometimes have faculty and graduate students maintain the equipment, or we call in vendors or repair services as needed. Since ISE does not have a technician we have no in house regular resource for equipment upkeep.

3. Describe the type and number of support personnel available to install, maintain, and manage departmental hardware, software, and networks.

As mentioned above, computer hardware and software maintenance is supported by Engineering Network Services in the College of Engineering. The department also hires one graduate student ½ time each semester to help maintain computers and the department’s website. The graduate assistant works in unison with the college of engineering’s computer support department if necessary.

4. Describe the type and number of support personnel available to install, maintain, and manage laboratory equipment.

As also mentioned above, this is problematic. In the individual labs, graduate students install, maintain and manage the equipment. Since they are assigned to labs related to their area of interest, maintaining the lab equipment becomes part of their educational experience. However this can create problems as students turn over and have varying degrees of competency. Also, maintaining equipment is not the top priority of students or faculty as their main functions lie elsewhere.

C. Major Instructional and Laboratory Equipment

In Appendix C, include a list of major instructional and laboratory equipment.
CRITERION 9. PROGRAM CRITERIA

Describe how the program satisfies any applicable Program Criteria. If already covered elsewhere in the Self-Study Report, provide appropriate references.

There are two program criteria for Industrial Engineering programs: Program Criteria 1 concerns Curriculum and Program Criteria 2 concerns Faculty.

1. Curriculum

The program must demonstrate that graduates have the ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment and energy. The program must include in-depth instruction to accomplish the integration of systems using appropriate analytical, computational, and experimental practices.

The 126 semester credit hour BISE curriculum provides solid education and experience in the key components of the industrial engineering discipline as well as emphasis and learning in systems orientation, design, critical thinking, creativity and integration. Listed below in Table 9.1 are the required major courses with their significant contribution(s) to program criterion 1 above.

<table>
<thead>
<tr>
<th>Major Course</th>
<th>Contribution to Program Criterion 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 1110</td>
<td>Basic computational tools, data gathering and analysis, design and testing, multi-disciplinary orientation and teams.</td>
</tr>
<tr>
<td>STAT 3600</td>
<td>Data analysis and inference, analytic methods.</td>
</tr>
<tr>
<td>STAT 3610 / 3611</td>
<td>Design of experiments, statistical computation tools, experimental practices.</td>
</tr>
<tr>
<td>COMP 3010</td>
<td>Structured programming, design of computer programs, computational tools.</td>
</tr>
<tr>
<td>INSY 3020</td>
<td>People aspects including physiology and cognition.</td>
</tr>
<tr>
<td>INSY 3021</td>
<td>Job design, human data collection and analysis, integrated systems and safety and productivity.</td>
</tr>
<tr>
<td>INSY 3400</td>
<td>Analysis of stochastic systems, analytic and computational tools.</td>
</tr>
<tr>
<td>INSY 3410</td>
<td>Analysis of deterministic systems, analytic and computational tools.</td>
</tr>
<tr>
<td>INSY 3420</td>
<td>Modeling and analysis of complex, stochastic systems, (virtual) experimental practices, analytical and computational tools.</td>
</tr>
<tr>
<td>INSY 3600</td>
<td>Integrating financial aspects to technical project decisions, analytic and computational tools.</td>
</tr>
<tr>
<td>INSY 3700</td>
<td>Analysis and design of integrated production systems using analytic</td>
</tr>
</tbody>
</table>
and computational tools.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSY 3800</td>
<td>Materials, energy, manufacture design, experimental practices.</td>
</tr>
<tr>
<td>INSY 4330</td>
<td>Quality aspects of systems, experimental practices and design, gauge analysis and measurement.</td>
</tr>
<tr>
<td>INSY 4500</td>
<td>Consideration of energy and sustainability, diverse work teams, ethics and regulations in systems.</td>
</tr>
<tr>
<td>INSY 4700</td>
<td>Integrated manufacturing systems including materials, information and equipment aspects. Use of analytic and computational tools.</td>
</tr>
<tr>
<td>INSY 4800</td>
<td>Design of integrated solutions to real and complex systems in industry. Use of analytic and computational tools with consideration of people, information, equipment, materials and (sometimes) energy. Extensive field work including data acquisition and analysis.</td>
</tr>
<tr>
<td>INSY Electives (2)</td>
<td>In depth learning of certain topics within an integrated context.</td>
</tr>
<tr>
<td>ENGR Elective</td>
<td>Fundamentals of engineering science.</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>Complementary learning of materials, information and computing, experimental design and analysis, or INSY elective (see above).</td>
</tr>
</tbody>
</table>

In addition to the information provided in Table 9.1, we also use the two program criteria as outcomes “l” and “m” that we assess in the same way and using the same processes that we do for outcomes “a” through “k”. We have previously discussed this process in Criterion 3: Program Outcomes of this Self Study Report.

2. Faculty

*Evidence must be provided that the program faculty understand professional practice and maintain currency in their respective professional areas. Program faculty must have responsibility and sufficient authority to define, revise, implement, and achieve program objectives.*

Nearly all ISE faculty members are members of IIE, and many are Senior or Fellow members. One of our staff members is a Regional Vice President of IIE. Some are registered professional industrial engineers and certified safety professionals or ergonomists.

All have earned PhD’s in industrial engineering (or closely aligned disciplines) at well regarded U.S. institutions. Many hold or have held editorial positions in noted journals in the field and all publish regularly in respected, mainstream journals.

Most faculty members have current research grants with prestigious funding sources including National Science Foundation, National Institute of Occupational Safety and Health, Argonne National Laboratory, NASA, DoD and many private industries. Several (Black, Bulfin, Park) have written the leading textbooks in their fields. The department was recognized this year by *U.S. News & World Report* as 24th in IE graduate education.
(26th in 2009). We are the highest ranked engineering program at Auburn University. We believe that the dominant factor in this recognition is the achievements of the faculty members. We describe our faculty members and their credentials more fully in Criterion 6 of this report and their resumes are all shown in Appendix B.

Addressing responsibility and authority, the ISE program is continually shaped by its constituencies with the faculty members assuming the leadership role of analyzing data and suggesting actions. Within the general scope of the mission of Auburn University and the College of Engineering, we are largely free to control our BISE curriculum and courses to realize program objectives and outcomes.
Appendix A. Course Syllabi

ENGR 1110: Introduction to Industrial & Systems Engineering
(Required for B.I.S.E.)

Department of Industrial & Systems Engineering
Spring 2009

Instructor: Ms. LuAnn Sims
E-mail: simslua@auburn.edu
Office: A-1 Office: Shelby Center 3301C/Phone (334) 844-1430
Office Hours: Drop by or email/phone for appointment

Teaching Assistants E-mail Section Office
Vijay Murugesan murugvi@auburn.edu 18, 24 Shelby Center 3336
Sean Salvas sts0003@auburn.edu 17, 23 OSE Village

• Prerequisites: None
• Credit Hours: 2
• Course Website: Maintained on Blackboard.
• Lectures:
  Sec. 18, 23: Tues. 11:00 - 11:50 am Shelby Center 1122
  Sec. 17, 24: Tues. 2:00 - 2:50 pm Shelby Center 1122
• Labs:
  Sec. 18, 24: Thur. 9:30 am - 12:00 pm Shelby Center 3205
  Sec. 17, 23: Thur. 12:30 - 3:00 pm Shelby Center 3205

2009 Catalog Description: The AU Bulletin description is “Introduction to engineering design, engineering teams, graphical presentation, technical writing, and oral presentation.”

Required Material:
• Engineering Computer Network Account: ALL students must have an ACTIVE engineering computer network account from Engineering Network Services to be able to login to the labs in Shelby Center.
• Calculator Policy: Students may not have calculators that store text and/or can connect to Bluetooth devices during class. The only calculators acceptable for in-class exams or quizzes are: TI-30XA, TI-30XIIB, & TI-34II.

Course Learning Outcomes: Students will acquire an introduction to Industrial and Systems Engineering, including accounting and engineering economics, optimization, probability & statistics, facility layout, quality control, human factors, and ethics. Students will be introduced to engineering design and teaming by the use of a design project as a vehicle for skill development. The student will become proficient in the use of Microsoft Word, Excel, and PowerPoint and will receive introductory training in SolidEdge and Visual Basic for Applications (VBA).
Grading Policy: Lab and Lecture attendance grades are the percent of attendance as measured by the sign in sheets provided by the instructor or TA. Students are given the opportunity to earn extra credit worth up to 110 points by attending professional seminars, presenting a PowerPoint presentation on a section in the textbook, and/or joining professional engineering societies. The following is a description of how grades will be calculated:

**Weighted grades** on labs, quizzes, group projects, and attendance will be based on the following scale:

<table>
<thead>
<tr>
<th>Graded Labs, 10 (50 points each)</th>
<th>500 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes, 2 (75 points each)</td>
<td>150 points</td>
</tr>
<tr>
<td>Performance Trials</td>
<td>100 points</td>
</tr>
<tr>
<td>Preliminary Report</td>
<td>100 points</td>
</tr>
<tr>
<td>Final Design Report</td>
<td>100 points</td>
</tr>
<tr>
<td>Final Design Presentation</td>
<td>100 points</td>
</tr>
<tr>
<td>Group Participation</td>
<td>100 points</td>
</tr>
<tr>
<td>Lecture Attendance</td>
<td>100 points</td>
</tr>
<tr>
<td>Lab Attendance</td>
<td>100 points</td>
</tr>
</tbody>
</table>

**Total Possible Points (w/out Bonus)** 1350 points

Final course grades will be determined based upon points obtained in course:

<table>
<thead>
<tr>
<th>Student’s Total Points</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1215</td>
<td>A</td>
</tr>
<tr>
<td>≥ 1080</td>
<td>B</td>
</tr>
<tr>
<td>≥ 945</td>
<td>C</td>
</tr>
<tr>
<td>≥ 810</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 810</td>
<td>F</td>
</tr>
</tbody>
</table>

Topics Covered:

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro to IE Probability &amp; Statistics; Quality Control</td>
<td>Problem Solving (Model Eliciting) VBA</td>
</tr>
<tr>
<td>Tiger Air Project Accounting; Engineering Economics</td>
<td>Teamwork on Design Project 1 Performance Trials</td>
</tr>
<tr>
<td>Engineering Graphics Computer Programming/VBA</td>
<td>Teamwork on Design Project 2 Taguchi Air (Team)</td>
</tr>
<tr>
<td>Human Factors Facility Layout; Optimization</td>
<td>Accounting &amp; Engineering Economics Excel</td>
</tr>
<tr>
<td>Engineering Ethics MS Excel, Word, &amp; PowerPoint; Technical Writing</td>
<td>Personality Test &amp; Write-Up SolidEdge</td>
</tr>
</tbody>
</table>

Relationship to Program Outcomes:

<table>
<thead>
<tr>
<th>ABET Outcomes:</th>
<th>Assessments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(d) An ability to function on multi-disciplinary teams</td>
<td>• Points awarded by peer evaluations of design team members</td>
</tr>
<tr>
<td>(i) A recognition of the need for, and an ability to engage in life-long learning</td>
<td>• Grades on the team-submitted preliminary reports, performance trials, final reports, and presentations</td>
</tr>
<tr>
<td>(l) Be able to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy</td>
<td>• Attendance in professional seminars.</td>
</tr>
<tr>
<td></td>
<td>• Extra credit for membership in professional engineering societies</td>
</tr>
<tr>
<td></td>
<td>• Grades on the preliminary and final group project reports</td>
</tr>
</tbody>
</table>

Syllabus Prepared by: LuAnn Sims Date: 12-29-08
**STAT 3600: Probability and Statistics I**  
(Required for B.I.S.E.)

Department of Industrial & Systems Engineering  
Fall 2009

**Instructor:** Saeed Maghsoodloo  
**E-mail:** maghsood@eng.auburn.edu  
**Office:** Shelby Center 3301H / Phone (334) 844-1405  
**Office Hours:** TBA

- **Prerequisites:**  
  (MATH 1620) Calculus II, OR  
  (MATH 1627) Honors Calculus II, OR  
  (MATH 1720) Calculus for Engineering & Science II

- **Credit Hours:** 3
- **Course Website:** [www.eng.auburn.edu/~maghsood/homepage.html](http://www.eng.auburn.edu/~maghsood/homepage.html)
- **Lectures:** Mon., Wed., Fri. 12:00 - 12:50 pm  
  Shelby Center 1126

**2009 Catalog Description:** The AU Bulletin description is “Calculus-based introduction to probability and statistics with an emphasis on practical problem-solving.”

**Required Material:**

**Course Learning Outcomes:** To provide the student with the basic theory and procedures of probability, to introduce the student to descriptive statistics, and basic estimation concepts with emphasis throughout on applications in industrial engineering.

**Grading Policy:** The following is a description of how grades will be calculated.

**Weighted grades** on homework assignments and exams will be based on the following scale:

- Homework Assignments 15%
- Exams, 3 18.3 % (each)
- Final exam 30%

**Final course grades** will be determined based on the following scale:

- Student’s Final Average  ≥ 90 % A
- Student’s Final Average  ≥ 80 % B
- Student’s Final Average  ≥ 70 % C
- Student’s Final Average  ≥ 60 % D
- Student’s Final Average  < 60 % F
Topics Covered:

<table>
<thead>
<tr>
<th>Duration</th>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1 - 2</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td>Weeks 2 - 3</td>
<td>Introduction to probability</td>
</tr>
<tr>
<td>Week 4</td>
<td>One-dimensional random variables and their distributions</td>
</tr>
<tr>
<td>Week 5</td>
<td>Expected-value and Variance Operators</td>
</tr>
<tr>
<td>Week 5</td>
<td>Functions of one random variable</td>
</tr>
<tr>
<td>Weeks 6 - 7</td>
<td>Bernoulli, binomial, geometric, Pascal, Hypergeometric, &amp; Poisson (Discrete Distributions)</td>
</tr>
<tr>
<td>Week 8</td>
<td>Uniform, exponential, and gamma (Continuous Distributions)</td>
</tr>
<tr>
<td>Week 9</td>
<td>Normal distribution</td>
</tr>
<tr>
<td>Week 10</td>
<td>Linear combinations and the Central Limit Theorem</td>
</tr>
<tr>
<td>Week 11</td>
<td>Joint probability distributions</td>
</tr>
<tr>
<td>Week 12</td>
<td>Point estimation</td>
</tr>
<tr>
<td>Week 13</td>
<td>Normally distributed sampling distributions (Chi-square &amp; Student's t)</td>
</tr>
<tr>
<td>Week 14</td>
<td>Interval estimation for parameters of a normal universe and for proportions</td>
</tr>
</tbody>
</table>

ABET Outcomes:

<table>
<thead>
<tr>
<th>Assessments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) An ability to apply knowledge of mathematic, science, and engineering</td>
</tr>
<tr>
<td>• Use of (combinatorial) mathematics to compute the unconditional and conditional probabilities of events.</td>
</tr>
<tr>
<td>(b) An ability to design and conduct experiments, as well as to analyze and interpret data</td>
</tr>
<tr>
<td>• Homework and exam questions on data summary and tabulation</td>
</tr>
</tbody>
</table>

Syllabus Prepared by: Saeed Maghsoodloo
Date: 9-15-09
STAT 3610-11: Probability & Statistics II/Lab
(Required for B.I.S.E.)

Department of Industrial & Systems Engineering
Spring 2010

Instructor: S. Maghsoodloo
E-mail: maghsood@eng.auburn.edu
Office: Shelby Center 3301H/Phone (334) 844-1405
Office Hours: TBA

Teaching Assistants

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Section</th>
<th>Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashley Pearce</td>
<td><a href="mailto:harri26@auburn.edu">harri26@auburn.edu</a></td>
<td>001</td>
<td>Shelby 3323</td>
</tr>
<tr>
<td>Onur Uludag</td>
<td><a href="mailto:ozu0001@auburn.edu">ozu0001@auburn.edu</a></td>
<td>001</td>
<td>Shelby 3341</td>
</tr>
</tbody>
</table>

- Prerequisites: STAT 3600
- Credit Hours: STAT 3610 (3); STAT 3611 (1)
- Course Website: http://www.eng.auburn.edu/~maghsood/homepage.html
- Lectures: MWF 10:00am-10:50am Shelby Center 1126
- Labs: Monday 12:00 – 2:30 Shelby Center 3205

2010 Catalog Description: The AU Bulletin description for STAT 3610 is “Continuation of STAT 3600”. For STAT 3611, the Bulletin description is “The application of statistical techniques from STAT 3610.”

Required Material:
- Other: At least the student version of Minitab. Preferably, purchase the professional version (Release 15 at http://www.minitab.com). Or rent Minitab for 6 months at the rate of $29.99 from http://www.onthehub.com/minitab.
- Engineering Computer Network Account: ALL students must have an ACTIVE engineering computer network account from Engineering Network Services to be able to login to the labs in Shelby Center.
- Calculator Policy: Students may not have calculators that store text and/or can connect to Bluetooth devices during class. The only calculators acceptable for in-class exams or quizzes are: TI-30XA, TI-30XIIB, & TI-34II.

Course Learning Outcomes: Students will acquire an understanding and be able to determine confidence intervals, tests of hypotheses, Analysis of Variance, Linear Regression, Goodness-of-Fit, and Contingency Tables.
Grading Policy:

Assignments: Roughly 15%
Three Hourly tests: Roughly 57%
Final Exam: Per force 28%

Grading Scale: A = 89.50-100; B = 79.50-89.49; C = 69.50-79.49; D = 59.50-69.49

Topics Covered:

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1&amp;2</td>
<td>1/11/2010 Confidence Intervals, on one Parameter</td>
</tr>
<tr>
<td>Weeks 3-5</td>
<td>1/25/2010 Tests of Hypotheses on one Parameter</td>
</tr>
<tr>
<td>Weeks 6-8</td>
<td>2/8/2010 Statistical Inference on Two Parameters</td>
</tr>
<tr>
<td>Week 9-11</td>
<td>2/25/2010 Single-Factor ANOVA</td>
</tr>
<tr>
<td>Week 12</td>
<td>3/8/2010 Simple Linear Regression</td>
</tr>
<tr>
<td>Weeks 13&amp;14</td>
<td>3/22/2010 Multiple Linear Regression</td>
</tr>
<tr>
<td>Week 15</td>
<td>4/5/2010 Goodness-of-Fit</td>
</tr>
<tr>
<td>Week 16</td>
<td>4/19/2010 Contingency Tables</td>
</tr>
</tbody>
</table>

ABET Outcomes:

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

k  An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Assessments:

• Specific test questions on statistical inference about parameters of one or more normal populations (such as test of hypothesis and confidence intervals).

• Homework and exam questions on Fractional Factorials designs in base 2.

• Labs 1, 2, & 3 using Excel and Minitab to perform descriptive statistics. Drawing random samples from a relatively large population to illustrate the concept of bias in estimation and to verify that the standard error of the mean is equal to standard deviation of individuals divided by the square root of the sample size.

Syllabus Prepared by:  S Maghsoodloo
Date: 12-29-09
INSY 3020: Occupational Safety & Ergonomics  
(Required for B.I.S.E.)

Department of Industrial & Systems Engineering  
Spring 2008

Instructor I: Robert Thomas, PhD, PE, CPE  
E-mail: rthomas@eng.auburn.edu  
Office: Shelby Center 3310  
Office Hours: By Appointment

Instructor II: Jerry Davis, PhD, CPE, CSP  
E-mail: davisga@auburn.edu  
Office: Shelby Center 3320  
Office Hours: Tues. & Thurs. 7:30 - 8:30 am

Teaching Assistant: Rani Muhdi, MS, ASP  
E-mail: muhdira@auburn.edu  
Office: Shelby Center 3323  
Office Hours: Tues. & Thur. 11:00 - 12:00 pm

Prerequisites: None  
Credit Hours: 3  
Lectures: Tues. & Thurs. 12:30 - 1:45 pm  
Ramsey 304B

2008 Catalog Description: The AU Bulletin description is “Basic principles of occupational safety engineering and ergonomics in the evaluation and design of occupation work areas and processes that include human operators.”

Required Material:
  - Supplementary Text: Work Design-Industrial Ergonomics
  - Supplementary Text: Safety & Health for Engineers

Course Learning Outcomes: Upon completion of this course, students will possess basic occupational safety and ergonomics knowledge that will enable them to recognize hazards and apply appropriate countermeasures. They will be able to design a safe and ergonomically correct working environment. Students will have gained a professional understanding and appreciation for the safety function in their future organizations.

Grading Policy: The following is a description of how grades will be calculated:

Weighted grades on homework, quizzes, and exams will be based on the following scale:
- Homework & Quizzes: 10%
- Exam 1: 30%
- Exam 2: 30%
- Exam 3: 30%
**Final course grades** will be determined based upon points obtained in course:

<table>
<thead>
<tr>
<th>Student’s Final Average</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 90 %</td>
<td>A</td>
</tr>
<tr>
<td>≥ 80 %</td>
<td>B</td>
</tr>
<tr>
<td>≥ 70 %</td>
<td>C</td>
</tr>
<tr>
<td>≥ 60 %</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60 %</td>
<td>F</td>
</tr>
</tbody>
</table>

**Topics Covered:**

<table>
<thead>
<tr>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro to Ergonomics</td>
</tr>
<tr>
<td>Environmental Working Hazards</td>
</tr>
<tr>
<td>Fundamental OSHA Concepts</td>
</tr>
<tr>
<td>Anthropometry &amp; Work Physiology</td>
</tr>
<tr>
<td>Human Factors</td>
</tr>
<tr>
<td>OSHA Inspections &amp; Citations</td>
</tr>
<tr>
<td>Safety &amp; Risk</td>
</tr>
<tr>
<td>Walking &amp; Working Surfaces</td>
</tr>
<tr>
<td>OSHA Rules &amp; Standards</td>
</tr>
<tr>
<td>Workplace Design &amp; ADA</td>
</tr>
<tr>
<td>Safety Training &amp; Careers</td>
</tr>
<tr>
<td>OSHA Recordkeeping</td>
</tr>
<tr>
<td>Tools, Seating, &amp; Work Areas</td>
</tr>
<tr>
<td>Cumulative Trauma Disorders</td>
</tr>
<tr>
<td>Biomechanics &amp; Manual Material Handling</td>
</tr>
</tbody>
</table>

**ABET Outcomes:**

<table>
<thead>
<tr>
<th>(d) An ability to function on multi-disciplinary teams</th>
</tr>
</thead>
</table>
| - Students are randomly assigned to multidisciplinary teams and participate in two exercises involving different maintenance tasks.  
  **practical exercise on human error and asked to evaluate two different maintenance tasks.** |

<table>
<thead>
<tr>
<th>(f) An understanding of professional and ethical responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Grades on an assignment where students analyze accidents where there has been an injury/fatality and log the appropriate incidents on an official OSHA document (Form 300).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Grades on particular test questions from Exam I concerning the general/global responsibility that all engineers have for designing systems that protect the health and safety of workers and their related environment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(i) A recognition of the need for, and an ability to engage in life-long learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Grades on particular test questions from Exam III about various types of professional organizations involving occupational safety and health.</td>
</tr>
</tbody>
</table>

**Syllabus Prepared by:** Robert Thomas  
**Date:** 1-8-08
INSY 3021: Methods Engineering, Work Measurement & Lab
(Required for B.I.S.E.)
Department of Industrial & Systems Engineering
Spring 2009

Instructor: Jerry Davis, PhD, CPE, CSP
E-mail: davisga@auburn.edu
Office: Shelby Center 3320
Office Hours: By appointment

Teaching Assistants  E-mail  Office
Adam Piper  piperak@auburn.edu  Shelby 3323
Eric Boelhouwer  boelhej@auburn.edu  Shelby 3323
Rio Tang  rzt0002@auburn.edu  Shelby 3323

- Prerequisites: None
- Credit Hours: 3
- Course Website: Maintained on Blackboard

Lectures:  
1126  Sec. 1, 2, 3:  Tues. & Thur. 11:00 - 11:50 am  Shelby Center

Labs:  
3210  Sec. 1:  Thur. 2:00 - 4:45 pm  Shelby Center
3210  Sec. 2:  Tues. 2:00 - 4:45 pm  Shelby Center
3210  Sec. 3:  Wed. 3:00 - 5:45 pm  Shelby Center

2009 Catalog Description: The AU Bulletin description is “Develops the student’s ability to design workplaces and methods while providing an understanding of the work measurements process. Enables students to generate much of the basic methods data utilized in most industrial engineering projects.”

Required Material:
- Stopwatch: Must be accurate to the nearest 1/10 of a second, or 1/100 of a minute. Must have lap time capabilities. Can’t be part of another device.

Course Learning Outcomes: Students are introduced to classical Industrial & Systems Engineering procedures related to the design of efficient work methods. Topics and applications discussed include: analysis of the work measurement process, design of labor content assessment systems, and ergonomic and safety considerations. Students will become proficient in writing formal reports about popular engineering topics.
Grading Policy: The following is a description of how grades will be calculated:

**Weighted grades** on labs, quizzes & homework, midterms, and final exams will be based on the following scale:

- Labs: 30%
- Quizzes & Homework: 10%
- Midterm: 25%
- Final Exam: 35%

**Final course grades** will be determined based upon points obtained in course:

- Student’s Final Average \( \geq 90 \% \) A
- Student’s Final Average \( \geq 80 \% \) B
- Student’s Final Average \( \geq 70 \% \) C
- Student’s Final Average \( \geq 60 \% \) D
- Student’s Final Average \(< 60 \% \) F

Topics Covered:

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Lab Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Introduction</td>
<td>Report Writing</td>
</tr>
<tr>
<td>History of Labor &amp; Labor Laws</td>
<td>Heat Allowances</td>
</tr>
<tr>
<td>Allowances</td>
<td>Tire Changing Methods</td>
</tr>
<tr>
<td>Typical IE Problems, Problem Solving Tools</td>
<td>Time Study</td>
</tr>
<tr>
<td>Time Study</td>
<td>Egress / Life Safety</td>
</tr>
<tr>
<td>Predetermined Time Systems</td>
<td>Heart Rate Monitoring</td>
</tr>
<tr>
<td>Work Sampling</td>
<td>Anthropometry</td>
</tr>
<tr>
<td>Data Collection Techniques/Methods</td>
<td>Office Ergonomics</td>
</tr>
<tr>
<td>Theory</td>
<td>Performance Rating</td>
</tr>
<tr>
<td>Work Measurement Research</td>
<td>Research Exercises</td>
</tr>
<tr>
<td>Case Study</td>
<td>Noise Allowances</td>
</tr>
<tr>
<td>Performance Rating</td>
<td>PBJ Sandwich Methods Design</td>
</tr>
</tbody>
</table>

**ABET Outcomes:**

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

- Grades on a homework/lab assignment in which the students collect and analyze sound pressure levels to determine if the levels are under permissible standards.

(c) An ability to design a system, component, or process to meet desired needs

- Grades on a lab report where students analyze the process of making peanut butter & jelly sandwiches then develop production standards and layouts.

(g) An ability to communicate effectively

- Grades on a lab report where students evaluate how ergonomically successful an office is.

Syllabus Prepared by: Jerry Davis
Date: 1-7-09
INSY 3400: Stochastic Operations Research  
(Required for B.I.S.E.)  
Department of Industrial & Systems Engineering  
Fall 2009

Instructor: Dr. Kevin R. Gue  
E-mail: kevin.gue@auburn.edu  
Office: Shelby Center 3314  
Office Hours: Fri. 10:00 am - 12:00 pm

Teaching Assistants  
Özgür Özmen  
E-mail: ozo0002@auburn.edu  
Office: Shelby 3341  
Office Hours: Mon. & Wed. 10:00 am - 12:00 pm

Vedat Çetinkaya  
E-mail: cetinkayavedat@gmail.com  
Office: Shelby 3332  
Office Hours: Mon. & Wed. 12:00 pm

- Prerequisites:  
  (ENGR 1110) Introduction to Engineering  
  (MATH 2660) Topics in Linear Algebra  
  (STAT 3600) Probability & Statistics I

- Credit Hours: 3

- Course Website: Maintained on Blackboard.

- Lectures: Tues. & Thur. 11:00 am - 12:15 pm Shelby Center 1126

2009 Catalog Description: The AU Bulletin description is “Modeling and analysis of decision-making and operations subject to randomness including decision analysis, stochastic dynamic programming, Markov chains, and queueing theory.”

Required Material:

- Engineering Computer Network Account: ALL students must have an ACTIVE engineering computer network account from Engineering Network Services (103 L-Building) to be able to login to the labs in Shelby Center (or any other engineering lab).

- Calculator Policy: As stated in the Tiger Cub, any violation of the academic honesty code will be reported to the Academic Honesty Committee. To avoid academic dishonesty, students are not to have calculators that store text and/or can connect to Bluetooth devices during class. The only calculators acceptable for in-class exams or quizzes are: TI-30XA, TI-30XIIB, and TI-34II.

Course Learning Outcomes: This course covers the fundamentals of stochastic operations research, including Markov chains and Queuing Theory. Our goal is to understand how to build and use probabilistic models of simple production and service systems. This is an important prerequisite course to follow-on courses in manufacturing systems and simulation.
Grading Policy: The following is a description of how grades will be calculated:

**Weighted grades** on quizzes, projects, and the final exam will be based on the following scale:

- Section Quizzes, 6 10 % each
- Projects 15 %
- Final exam 25 %

**Final course grades** will be determined based on the following scale:

- Student’s Final Average ≥ 90 % A
- Student’s Final Average ≥ 80 % B
- Student’s Final Average ≥ 70 % C
- Student’s Final Average ≥ 60 % D
- Student’s Final Average < 60 % F

Topics Covered:

<table>
<thead>
<tr>
<th>Duration</th>
<th>Lecture Topics</th>
<th>Duration</th>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introductions, Course intro</td>
<td>Weeks 11 - 12</td>
<td>CTMCs &amp; Birth-Death processes</td>
</tr>
<tr>
<td>Weeks 1 - 2</td>
<td>Review of probability</td>
<td>Week 12</td>
<td>Queuing: M/M/1</td>
</tr>
<tr>
<td>Weeks 2 - 3</td>
<td>Random variables</td>
<td>Week 13</td>
<td>Queuing: M/M/c</td>
</tr>
<tr>
<td>Week 4</td>
<td>Conditional probability</td>
<td>Week 13</td>
<td>Queuing: M/G/1</td>
</tr>
<tr>
<td>Week 5</td>
<td>Decision trees</td>
<td>Week 14</td>
<td>Queuing: G/G/1, G/G/c</td>
</tr>
<tr>
<td>Weeks 6 - 9</td>
<td>Markov chains</td>
<td>Week 14</td>
<td>Queuing: networks</td>
</tr>
<tr>
<td>Weeks 9 - 10</td>
<td>Exponential &amp; Poisson</td>
<td>Week 15</td>
<td>Queuing examples</td>
</tr>
</tbody>
</table>

ABET Outcomes:

<table>
<thead>
<tr>
<th>(a)</th>
<th>An ability to apply knowledge of mathematics, science, and engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Grades on a test question that measures the ability of the student to apply queuing theory to the solution of a decision-making problem subject to uncertainty.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(b)</th>
<th>An ability to design and conduct experiments, as well as analyze and interpret data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Grades on a homework assignment that measures the student’s ability to design a computer simulation model of a queuing system using a spreadsheet such as Excel. The parameters of the model are modified and the output generated by the computer model is analyzed and compared with the output of an analytical model.</td>
</tr>
</tbody>
</table>

Syllabus Prepared by: Kevin Gue
Date: 8-17-09
INSY 3410: Deterministic Operations Research  
(Required for B.I.S.E.)

Department of Industrial & Systems Engineering  
Fall 2009

Instructor: Dr. Haluk Yapicioglu  
E-mail: haluk@auburn.edu  
Office: Shelby Center 3301E  
Office Hours: Mon. & Thur. 4:00 - 5:00 pm, or by appointment

Teaching Assts  
E-mail  
Section  
Office  
Office Hours
Dirk Benade  db0011@auburn.edu  1  Shelby 3323  Mon. & Tues. 4:00 - 5:00 pm
Angela Setera  azs0042@auburn.edu  2  Shelby 3323  Mon. & Tues. 4:00 - 5:00 pm

Prerequisites:  
- (ENGR 1110) Introduction to Engineering  
- (MATH 2660) Topics in Linear Algebra

Credit Hours: 3

Course Website: Maintained on Blackboard.

Lectures:  
- Mon. & Wed. 11:00 - 11:50 am  Shelby Center 1126

Labs:  
- Sec. 1: Mon. 1:00 - 3:45 pm  Shelby Center 3205  
- Sec. 2: Wed. 1:00 - 3:45 pm  Shelby Center 3205

2009 Catalog Description: The AU Bulletin description is “Formulation, solution, interpretation, and implementation of mathematical models in operations research including linear programming, integer programming and network flows.”

Required Material:
- Software: Lingo, Excel 2007, MATLAB.
- Calculator Policy: As stated in the Tiger Cub, any violation of the academic honesty code will be reported to the Academic Honesty Committee. To avoid academic dishonesty, students are not to have calculators that store text and/or can connect to Bluetooth devices during class. The only calculators acceptable for in-class exams or quizzes are: TI-30XA, TI-30XIIB, and TI-34II.

Course Learning Outcomes: Students will understand the use of linear programming, integer programming and network flows for modeling problem solutions in deterministic operations research.

Grading Policy: Grades on labs, programming projects, exams, and lecture attendance will be weighted and included in the students’ final averages. A tiger cub excused absence does not
count as a missed class. Points from lecture attendance will be given based on the following scale:

<table>
<thead>
<tr>
<th>Attendance Percentage</th>
<th>Attendance Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Attendance %) ≥ 90 %</td>
<td>5</td>
</tr>
<tr>
<td>(Attendance %) ≥ 80 %</td>
<td>4</td>
</tr>
<tr>
<td>(Attendance %) ≥ 70 %</td>
<td>3</td>
</tr>
<tr>
<td>(Attendance %) ≥ 60 %</td>
<td>2</td>
</tr>
<tr>
<td>(Attendance %) ≥ 50 %</td>
<td>1</td>
</tr>
<tr>
<td>(Attendance %) &lt; 50 %</td>
<td>0</td>
</tr>
</tbody>
</table>

**Weighted grades** on lecture attendance, labs, programming projects, and exams will be based on the following scale:

- Lecture Attendance --- 5%
- Lab Assignments --- 25%
- Programming Assignment September 28th
- Exam I September 30th 20%
- Exam II November 4th 20%
- Final Exam December 11th 25%

**Final course grades** will be determined based on the following scale:

- Student’s Final Average ≥ 90 % A
- Student’s Final Average ≥ 80 % B
- Student’s Final Average ≥ 70 % C
- Student’s Final Average ≥ 60 % D
- Student’s Final Average < 60 % F

**Topics Covered:**

<table>
<thead>
<tr>
<th>Topics Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling</td>
</tr>
<tr>
<td>Linear Programming &amp; Models</td>
</tr>
<tr>
<td>Simplex Method &amp; Revised Simplex</td>
</tr>
<tr>
<td>Sensitivity Analysis</td>
</tr>
<tr>
<td>Duality</td>
</tr>
<tr>
<td>Transportation Algorithm &amp; Models</td>
</tr>
<tr>
<td>MATLAB</td>
</tr>
</tbody>
</table>

**ABET Outcomes:**

| (a) An ability to apply knowledge of mathematics, science, and engineering |
| (e) An ability to identify, formulate, and solve engineering problems  |

**Assessments:**

- Test question to measure competency in using Linear Algebra and the simplex algorithm to solve a linear programming problem.
- Graded homework to measure competency in formulating and using network models to solve complex engineering problems.
| An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice | Test to measure competency in the use of LINGO programming language to solve deterministic OR problems |

Syllabus Prepared by: Haluk Yapicioglu  
Date: 8-17-09
INSY 3420: Simulation
(Required for B.I.S.E.)
Department of Industrial & Systems Engineering
Spring 2008

Instructor: Jeffrey Smith
E-mail: jsmith@auburn.edu
Office: Shelby 3306
Office Hours: Mon. & Tues. 1:00 - 2:30 pm

Teaching Assistants E-mail Office Office Hours
Jimmy Cox jae0010@auburn.edu Shelby 3341 Mon. & Wed. 9:30 - 11:00 am
Taner Bak baktane@auburn.edu Shelby 3333 Tues. & Thurs. 9:30 - 11:00 am

- Prerequisites: (COMP 1210) Fundamentals of Computing I, OR
  (INSY 3400) Stochastic Operations Research
- Credit Hours: 3
- Lectures: Sec. 1, 2: Tues. & Thur. 8:00 - 8:50 am
- Labs: Sec. 1: Wed. 12:30 - 3:00 pm
  Sec. 2: Wed. 3:00 - 5:30 pm

2008 Catalog Description: The AU Bulletin description is “Simulation procedures for solving complex systems analysis problems. Emphasis on random processes, model building and construction of computer simulation models.”

Required Material:

Course Learning Outcomes: Students should understand the basic concepts of simulation modeling and analysis and have experience developing simulation models in Excel and the simulation package *Arena*. In addition, students should have experience using simulation models to analyze complex systems.
**Grading Policy:** Late homework/labs will be penalized by 33% per day. The following is a description of how grades will be calculated:

*Weighted grades* on labs, homework, course projects, and exams will be based on the following scale:

- Labs/Homework: 15%
- Course Project: 15%
- Arena Exam: 20%
- Midterm Exam: 20%
- Final Exam: 35%

**Final course grades** will be determined based on the following scale:

- Student’s Final Average $\geq 90\%$ A
- Student’s Final Average $\geq 80\%$ B
- Student’s Final Average $\geq 70\%$ C
- Student’s Final Average $\geq 60\%$ D
- Student’s Final Average $< 60\%$ F

**Topics Covered:**

<table>
<thead>
<tr>
<th>Duration</th>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/12</td>
<td>Course Introduction</td>
</tr>
<tr>
<td>1/14</td>
<td>Randomness in Simulation</td>
</tr>
<tr>
<td>1/19</td>
<td>Monte Carlo Simulation</td>
</tr>
<tr>
<td>2/2</td>
<td>Fundamental Simulation Concepts</td>
</tr>
<tr>
<td>2/9</td>
<td>Process Oriented Modeling and Arena</td>
</tr>
<tr>
<td>2/5</td>
<td>Input Modeling</td>
</tr>
<tr>
<td>3/10</td>
<td>Call Center Model</td>
</tr>
<tr>
<td>4/8</td>
<td>Output Analysis</td>
</tr>
</tbody>
</table>

**ABET Outcomes:**

- **(e)** An ability to identify, formulate, and solve engineering problems

  - Grades on an assignment where students analyze input data, fit a statistical distribution, and conduct experiments using simulation modeling.

- **(k)** An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

  - Grades on an assignment where students use Arena (simulation package) to develop a simulation model to analyze systems.

**Syllabus Prepared by:** Jeff Smith

**Date:** 1-8-08
INSY 3600: Engineering Economy
(Required for B.I.S.E.)
Department of Industrial & Systems Engineering
Fall 2009

Instructor: Chan S. Park
E-mail: park@eng.auburn.edu
Office: Shelby 3301P
Office Hours: Tues. 3:30 - 4:30 pm

Teaching Assistants

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Office</th>
<th>Office Hours</th>
<th>Student Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hwansik Lee</td>
<td><a href="mailto:leehwan@auburn.edu">leehwan@auburn.edu</a></td>
<td>Shelby 3331</td>
<td>Mon. &amp; Wed. 11:00 am</td>
<td>A – F</td>
</tr>
<tr>
<td>Komkrit Pitiruek</td>
<td><a href="mailto:pitirko@auburn.edu">pitirko@auburn.edu</a></td>
<td>Shelby 3331</td>
<td>Mon. &amp; Wed. 11:00 am</td>
<td>G – M</td>
</tr>
<tr>
<td>Greer Eubanks</td>
<td><a href="mailto:mge0002@auburn.edu">mge0002@auburn.edu</a></td>
<td>Shelby 3323</td>
<td>Mon. &amp; Wed. 11:00 am</td>
<td>N – Z</td>
</tr>
</tbody>
</table>

Prerequisites:
- (MATH 2630) Calculus III
- (ENGR 1110) Introduction to Engineering

Credit Hours:
3

Course Website:
Maintained on Blackboard.

Lectures:
Tues. & Thur. 9:30 - 10:45 am Broun Hall 238

2009 Catalog Description: The AU Bulletin description is “Principles required in engineering economic studies.”

Required Material:
- Text Website: http://www.prenhall.com/park

Course Learning Outcomes: A high degree of competence in making a quantitative evaluation of engineering proposals in terms of worth and cost should be achieved. The student should develop an understanding of the economic factors associated with the engineering design process and an awareness of the economic problems confronting an industrial enterprise or other organization.

Grading Policy: Grades on exams, homework assignments, and lecture attendance will be weighted and included in the students’ final averages. There are a total of 30 scheduled classes. Attendance grades will be determined based on the following scale:

<table>
<thead>
<tr>
<th>Number of Absences</th>
<th>Attendance Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>10 %</td>
</tr>
<tr>
<td>4 - 5</td>
<td>8 %</td>
</tr>
<tr>
<td>6 - 9</td>
<td>6 %</td>
</tr>
<tr>
<td>10 - 12</td>
<td>0 %</td>
</tr>
<tr>
<td>13 - ∞</td>
<td>0 % and lower final average by one letter</td>
</tr>
</tbody>
</table>
**Weighted grades** on lecture attendance, homework assignments, and exams will be based on the following scale:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Attendance</td>
<td>10%</td>
</tr>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Exam I (September 17th)</td>
<td>20%</td>
</tr>
<tr>
<td>Exam II (October 22nd)</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam (December 15th)</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Final course grades** will be determined based on the following scale:

<table>
<thead>
<tr>
<th>Student’s Final Average</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 90 %</td>
<td>A</td>
</tr>
<tr>
<td>≥ 80 %</td>
<td>B</td>
</tr>
<tr>
<td>≥ 70 %</td>
<td>C</td>
</tr>
<tr>
<td>≥ 60 %</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60 %</td>
<td>F</td>
</tr>
</tbody>
</table>

**Topics Covered:**

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Economic Decisions</td>
<td>pp. 1 - 19</td>
</tr>
<tr>
<td>Time Value of Money/Economic Equivalence</td>
<td>pp. 20 - 32</td>
</tr>
<tr>
<td>Interest Formulas; Nominal &amp; Effective Interest</td>
<td>pp. 33 - 94</td>
</tr>
<tr>
<td>Equivalence Calculations</td>
<td>pp. 94 - 100</td>
</tr>
<tr>
<td>Debt Management</td>
<td>pp. 100 - 110</td>
</tr>
<tr>
<td>Measure Inflation</td>
<td>pp. 126 - 140</td>
</tr>
<tr>
<td>Equivalence Calculations under Inflation</td>
<td>pp. 140 - 149</td>
</tr>
<tr>
<td>Present Worth Analysis</td>
<td>pp. 160 - 181</td>
</tr>
<tr>
<td>Mutually Exclusive Alternatives</td>
<td>pp. 181 - 192</td>
</tr>
<tr>
<td>Annual Equivalent Analysis</td>
<td>pp. 210 - 220</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life-Cycle Cost Analysis</td>
<td>pp. 220 - 231</td>
</tr>
<tr>
<td>Rate of Return Analysis</td>
<td>pp. 250 - 260</td>
</tr>
<tr>
<td>Incremental Analysis</td>
<td>pp. 267 - 277</td>
</tr>
<tr>
<td>Book &amp; Tax Depreciation</td>
<td>pp. 302 - 329</td>
</tr>
<tr>
<td>Corporate Taxes</td>
<td>pp. 329 - 334</td>
</tr>
<tr>
<td>Project Cash Flow Analysis</td>
<td>pp. 348 - 371</td>
</tr>
<tr>
<td>Sensitivity Analysis</td>
<td>pp. 400 - 412</td>
</tr>
<tr>
<td>Benefit-Cost Ratio</td>
<td>pp. 490 - 500</td>
</tr>
<tr>
<td>Financial Statement</td>
<td>pp. 518 - 531</td>
</tr>
<tr>
<td>Ratio Analysis</td>
<td>pp. 532 - 540</td>
</tr>
</tbody>
</table>

**ABET Outcomes:**

<table>
<thead>
<tr>
<th>(e)</th>
<th>An ability to identify, formulate, and solve engineering problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>(h)</td>
<td>The broad education necessary to understand the impact of engineering solutions in a global and societal context.</td>
</tr>
<tr>
<td>(j)</td>
<td>A knowledge of contemporary issues</td>
</tr>
</tbody>
</table>

**Assessments:**

- Grades on homework assignments
- Grades on a test question on foreign exchange rates and the impact on businesses that obtain materials and supplies from these countries.
- Grades on the 2nd homework assignment where students analyze the financial ratio of Auburn University.
- Grades on participation and performance on an investment simulation game.

**Syllabus Prepared by:** Chan Park

**Date:** 8-17-09
INSY 3700: Operations Planning and Control
(Required for B.I.S.E.)

Department of Industrial & Systems Engineering
Spring 2009

Instructor: Dr. Kevin Gue
E-mail: kevin.gue@auburn.edu
Office: Shelby Center 3314
Office Hours: W 1300-1500

Teaching Assistants
Özgür Özmen  ozo0002@auburn.edu  Shelby 3341  TR 1400-1500
Vedat Çetinkaya  cetinkayavedat@gmail.com  Shelby 3332  F 1430-1630

• Prerequisites: INSY 3400, INSY 3410
• Credit Hours: 3
• Course Website: Maintained on Blackboard.
• Lectures: Tues. & Thurs. 8:30 pm – 9:20 am  Shelby Center 1124
• Labs: Section 1: Wed. 8:30 am - 11:00 am  Shelby Center 1126
       Section 2: Wed. 3:00 pm - 5:30 pm  Shelby Center 1126

2009 Catalog Description: “Analytical methods for operations planning and control, including forecasting systems, production planning, inventory control systems, scheduling systems, and project management.”

Required Material:
• Text: Production & Operations Analysis by Steven Nahmias, 6th edition.
Littlefield Technologies simulation, which you must purchase.
• Engineering Computer Network Account: ALL students must have an ACTIVE engineering computer network account from Engineering Network Services to be able to login to the labs in Shelby Center.

Course Learning Outcomes: Students will learn the fundamentals of operations planning and control, with particular emphasis on production systems and supply chain management. They will gain insight into demand forecasting, aggregate planning, inventory control, MRP systems, supply chain design, scheduling, and other topics. Throughout, emphasis will be placed on problem formulation, analysis, and appropriate implementation.
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Homework problem that will check for retention of ability to use LINGO to solve a linear programming problem as covered in INSY 3410 (Deterministic Operational Research).

Be able to integrate systems using appropriate analytical, computational and experimental practices.

Students solve a case study requiring the integration of analytical and computational skills.

Topics Covered:

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
<td>Focused problem solving</td>
</tr>
<tr>
<td>Scheduling</td>
<td>Beer game</td>
</tr>
<tr>
<td>Forecasting</td>
<td>Littlefield Technologies</td>
</tr>
<tr>
<td>Project Management</td>
<td>Goldratt’s Game</td>
</tr>
<tr>
<td>Aggregate Planning</td>
<td>Dynamic forecasting</td>
</tr>
<tr>
<td></td>
<td>Littlefield (2)</td>
</tr>
<tr>
<td>Inventory</td>
<td>Case Study—Applied Industries</td>
</tr>
<tr>
<td></td>
<td>Bucket brigades</td>
</tr>
<tr>
<td>Supply Chain</td>
<td>Case Study—Dukai’s Dilemma</td>
</tr>
<tr>
<td></td>
<td>Case Study—Exit</td>
</tr>
<tr>
<td>MRP</td>
<td>Newsboy</td>
</tr>
</tbody>
</table>

Grading Policy:

I compute grades as follows:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>25%</td>
</tr>
<tr>
<td>Test 2</td>
<td>25%</td>
</tr>
<tr>
<td>Final</td>
<td>35%</td>
</tr>
<tr>
<td>Labs</td>
<td>10%</td>
</tr>
<tr>
<td>HW</td>
<td>5%</td>
</tr>
</tbody>
</table>

You may request a re-grade of any exam by submitting a detailed, one-page explanation of the discrepancy. I will consider each case at the end of the term, but only if it appears that it may change your final grade. (I correct obvious arithmetic errors on the spot.)

If you miss an exam and have a valid Tiger Cub excuse, you have 7 calendar days to schedule an oral makeup exam. Failure to complete the makeup exam within one week of the actual exam will result in a score of zero for that exam. This policy does not apply to the final, which also may be an oral exam.

Syllabus Prepared by: Kevin R. Gue
Date: 8-08-09
INSY 3800: Manufacturing Processes
(Required for B.I.S.E.)
Department of Industrial & Systems Engineering
Fall 2009

Instructor: Dr. Lewis Payton
E-mail: payton@auburn.edu
Office: DML in Shop Building 2/Phone (334) 844-3315
Office Hours: Mon. & Fri. 1:00 - 2:00 pm
- Prerequisites: (MATL 2100) Introduction to Materials Science
- Credit Hours: 3
- Course Website: Maintained on Blackboard.
- Lectures: Mon. & Wed. 9:00 - 9:50 am Shelby Center 1126
- Labs: Per Blackboard


Required Material:
- Dress code: No hats, sunglasses, loose clothing, ties, or jewelry. Closed toe shoes and slacks are required whenever you are in the lab or on a tour. Hair must be worn up in a high ponytail or bun. Beards must be neatly trimmed to less than 0.5 inches.

Course Learning Outcomes: Upon completion of this course, the students will:
  a) Be able to communicate the design and production process for a simple mechanical product
  b) Be familiar with all the materials used in manufacturing
  c) Be familiar with the all the processes used in manufacturing
  d) Be familiar with all non-destructive and destructive testing techniques used in manufacturing
  e) Be able to do 2D and 3D CAD drawings of wiring harnesses and other assemblies
  f) Be able to do simple sheet metal drawings
  g) Be familiar with the concepts of Computer Numerically Controlled machines
  h) Be familiar with the FANUC CNC Control languages and MasterCAM
  i) Understand the relationships between CAD/CAM/CIM
  j) Be familiar with data acquisition methods such as LABVIEW

Grading Policy: The following is a description of how grades will be calculated:

Weighted grades on quizzes, homework assignments, exams, and labs will be based on the following scale:

- Short Quizzes, 10 (drop lowest grade) 300 Points
Homework Assignments  30-50 Points  
Exams, 3  300 Points  
Final Exam  150 Points  
Labs, 12-14  150-200 Points  

**Total Points Possible**  1000 Points

**Final course grades** will be determined based upon points obtained in course:

- Student’s Total Points > 900 A
- Student’s Total Points > 800 B
- Student’s Total Points > 700 C
- Student’s Total Points > 600 D
- Student’s Total Points ≤ 600 F

**Topics Covered:**

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety and Material</td>
<td>Safety</td>
</tr>
<tr>
<td>Metals and Alloys</td>
<td>Mechanical Testing/Load Frame labs</td>
</tr>
<tr>
<td>Plastics and Powder Materials</td>
<td>Metrology Labs</td>
</tr>
<tr>
<td>Composite Materials</td>
<td></td>
</tr>
<tr>
<td>Non-destructive testing procedures</td>
<td>Part Modeling/Hand Tools</td>
</tr>
<tr>
<td>Process Capability/Fundamentals of CASTING</td>
<td>SE Schematics/Casting Demos</td>
</tr>
<tr>
<td>Advanced Casting Processes/Powder Metallurgy Process</td>
<td>Assemblies</td>
</tr>
<tr>
<td>Sheet Metal Processes/Forging Processes</td>
<td></td>
</tr>
<tr>
<td>Friction in Metal Working/Extrusion Processes</td>
<td>Schematic Drawings</td>
</tr>
<tr>
<td>Fabrication of Plastics &amp; Composites/Intro to Metal cutting</td>
<td>Engineering Calculation Tools</td>
</tr>
<tr>
<td>Drilling, milling, broaching, lathes, Gear Production</td>
<td>Molded Parts</td>
</tr>
<tr>
<td>Non-traditional Machining Methods, Abrasive Machining</td>
<td></td>
</tr>
<tr>
<td>Work holding/Rapid Prototyping</td>
<td></td>
</tr>
<tr>
<td>CNC Processes/Welding Processes</td>
<td>Rendering CNC Operations</td>
</tr>
<tr>
<td>Welding Processes/Joining Processes</td>
<td>CNC Operations</td>
</tr>
<tr>
<td>Electronic Circuit Boards/Golden Rules of Design</td>
<td></td>
</tr>
</tbody>
</table>

**ABET Outcomes:**

(a) An ability to apply knowledge of mathematics, science, and engineering

**Assessments:**

Students are tested on their understanding of Fundamentals of Materials Science, including strength of materials and solids, dislocation dynamics and work hardening as they apply to modern manufacturing processes in the American Southeast. Students must exhibit a working knowledge of the terminology of metal cutting and deformation, plastic formation, composite formation, powder metallurgy, forging, casting, and rapid prototyping. Non-destructive testing is emphasized although all destructive testing methods are also covered for each process.
An ability to design a system, component, or process to meet desired needs

- Lab grades from a lab where the students design a manufacturing cell (part of a manufacturing system)
- Lab grades from a lab where the students design a NC process plan to make a fatigue specimen
- Lab grades from a lab where the students design a NC process plan to make a three axis NC machine (a work holding device).

Syllabus Prepared by: Dr. Lewis Payton
Date: 8-17-09
INSY 4330: Statistical Quality Design & Control
(Required for B.I.S.E.)
Department of Industrial & Systems Engineering
Fall 2009

Instructor: Alice Smith
E-mail: smithae@auburn.edu
Office: Shelby 3301 B
Office Hours: Mon. 11:00 am - 12:00 pm
Wed. 2:00 pm - 3:00 pm

Teaching Assistant: Jimmy Cox
E-mail: jac0010@auburn.edu
Office: Shelby 3341
Office Hours: Mon. 1:00 - 3:00 pm
Wed. 8:00 - 9:00 am

Prerequisites: (STAT 3610) Probability & Statistics II

Credit Hours: 3

Course Website: Maintained on Blackboard.

Lectures: Tues. & Thur. 9:30 - 10:45 am Shelby Center 1120

2009 Catalog Description: The AU Bulletin description is “Statistical process control and methods for quality improvement. Acceptance sampling for attributes and for variables.”

Required Material:
- Software: Minitab or QI Macros for Excel (free & distributed in class)
- Calculator Policy: As stated in the Tiger Cub, any violation of the academic honesty code will be reported to the Academic Honesty Committee. To avoid academic dishonesty, students are not to have calculators that store text and/or can connect to Bluetooth devices during class. The only calculators acceptable for in-class exams or quizzes are: TI-30XA, TI-30XIIB, and TI-34II.

Course Learning Outcomes: Same as “ISE Program Educational Objectives” below.

Grading Policy: The following is a description of how grades will be calculated:

**Weighted grades** on quizzes, projects, and exams will be based on the following scale:

- Quizzes: 25 %
- Project: 20 %
- Midterm exam: 20 %
- Final Exam: 35 %

**Final course grades** will be determined based on the following scale:

- Student’s Final Average ≥ 89 % A
- Student’s Final Average ≥ 79 % B
Student’s Final Average \( \geq 69 \% \) C
Student’s Final Average \( \geq 59 \% \) D
Student’s Final Average \( < 59 \% \) F

**Topics Covered:**

<table>
<thead>
<tr>
<th>Duration</th>
<th>Lecture Topics</th>
<th>Duration</th>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Quality History &amp; Deming’s 14 Points</td>
<td>Week 5</td>
<td>Statistical Basis &amp; Out-of-Control Rules</td>
</tr>
<tr>
<td>Week 2</td>
<td>DMAIC</td>
<td>Weeks 6 - 7</td>
<td>( \bar{X}, R, s, ) &amp; ( \bar{X} ) Charts</td>
</tr>
<tr>
<td>Week 3</td>
<td>Frequency Distribution &amp; Histogram</td>
<td>Weeks 6 - 7</td>
<td>Individual, Moving Range Charts</td>
</tr>
<tr>
<td>Week 3</td>
<td>Discrete &amp; Continuous Distributions</td>
<td>Weeks 8 - 9</td>
<td>np-chart, p-chart, c-chart, u-chart</td>
</tr>
<tr>
<td>Week 4</td>
<td>Sampling &amp; Point Estimation</td>
<td>Weeks 10 - 11</td>
<td>Cp &amp; Gauge R&amp;R</td>
</tr>
<tr>
<td>Week 4</td>
<td>Statistical Inference</td>
<td>Weeks 12 - 13</td>
<td>CUSUM and EWMA Charts</td>
</tr>
<tr>
<td>Week 5</td>
<td>Chance &amp; Assignable Causes</td>
<td>Week 14</td>
<td>Acceptance Sampling</td>
</tr>
</tbody>
</table>

**ABET Outcomes:**

**Assessments:**

(f) An understanding of professional and ethical responsibility
- A homework assignment about the need for data integrity, not fudging numbers, and how not to “lie with statistics.” A test question about Deming’s Red Bead Exercise about not passing defective products.

(j) A knowledge of contemporary issues
- Total Quality Management is a contemporary management style. A guest speaker on Motorola’s 6-sigma business strategy. A plant tour to see control charts in practice. Exam questions and evaluation of speaker and tour.

(l) Be able to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.
- Homework problem using Ishikawa Diagram (fishbone) to systematically look at effects and the causes that create or contribute to those effects.

(m) Be able to integrate systems using appropriate analytical, computational and experimental practices
- Homework and exam questions indicating student ability to use experiment design to link customer requirements to end-of-line product characteristics, to process characteristics and then to determine optimum set-points for processes before beginning process control.

Syllabus Prepared by: Alice Smith
Date: 8-17-09
INSY 4500: Professional Practice
(Required for B.I.S.E.)
Department of Industrial & Systems Engineering
Fall 2009

Jerry Davis, PhD, CPE, CSP
davisga@auburn.edu
Shelby Center 3310
Tues. 8:00 - 9:00 am

Teaching Assistant: Brad Townson
townsbj@auburn.e
Shelby Center
3323
TBA

Prerequisites: Senior standing in ISE.
Credit Hours: 1
Lectures: Mon. 10:00 - 10:50 am Shelby Center 1124

2009 Catalog Description: The AU Bulletin description is “Discussion and activities in current problems, ethics, the global context of, professional practice, professional opportunities and lifelong learning in Industrial and Systems Engineering.”

Required Material:
Text: None

Course Learning Outcomes:
a) Provide an understanding of current issues & opportunities in INSY including viewing things from a global context in the context of economics, environment, society & technology.
b) Provide an opportunity to dialogue with practitioners in Industrial and Systems Engineering.
c) Provide an opportunity to learn/practice job interviewing/resume preparation techniques.
d) To apprise students of the need for and opportunities for continuing education, professional associations, graduate level education and research.
e) To discuss ethical issues related to the practice of engineering.

Grading Policy: Late assignments will result in a reduced letter grade for each day late unless excused through a Tiger Cub authorized excuse. The following is a description of how grades will be calculated:

Weighted grades on assignments will be based on the following scale:

- Resume and Cover Letter 20 %
- Ethics Assessment Memo 20 %
- Global Issues Memo 10 %
- Career Plan Memo 10 %
- Module development/critiques 40 %

Final course grades will be determined based on the following scale:
Student’s Final Average $\geq$ 90 % A
Student’s Final Average $\geq$ 80 % B
Student’s Final Average $\geq$ 70 % C
Student’s Final Average $\geq$ 60 % D
Student’s Final Average $< 60$ % F

**Topics Covered:**

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>ABET Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professionalism &amp; Ethics; Environmental Concerns</td>
<td>(f) An understanding of professional and ethical responsibility</td>
</tr>
<tr>
<td>Interviewing &amp; Plant Visits (CDS speaker)</td>
<td>(g) An ability to communicate effectively</td>
</tr>
<tr>
<td>Career Planning/Continuing Education; Graduate School</td>
<td>(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context</td>
</tr>
<tr>
<td>Guest Industry Speakers; Engineering Consultants</td>
<td>(i) A recognition of the need for, and an ability to engage in life-long learning.</td>
</tr>
<tr>
<td>Job Search Techniques (speaker from Career Development Services, CDS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Assessments:</strong></td>
</tr>
<tr>
<td></td>
<td>An assignment requiring students to take the NSPE ethics exam</td>
</tr>
<tr>
<td></td>
<td>Students are graded on an oral presentation on <em>How to Give an Oral Presentation</em></td>
</tr>
<tr>
<td></td>
<td>International write-up about the sustainability in the business environment of countries other than the USA.</td>
</tr>
<tr>
<td></td>
<td>Students are surveyed about the opportunities for involvement in professional organizations and their goals for furthering their education.</td>
</tr>
</tbody>
</table>

**Syllabus Prepared by:** Jerry Davis  
**Date:** 9-2-09
INSY 4700: Manufacturing Systems
(Required for B.I.S.E.)
Department of Industrial & Systems Engineering
Fall 2009

Instructor: Dr. John L. Evans
E-mail: evansjl@auburn.edu
Office: Shelby Center 3308
Office Hours: Tues. & Thur. 1:00 - 2:00 pm
Wed. 10:00 - 11:00 am
Teaching Assistant: Kevin Barefield
E-mail: kjb0006@auburn.edu
Office: Shelby Center 3323
Office Hours: Tues. & Thur. 10:45 - 12:00 pm

- Prerequisites: (INSY 3420) Simulation
  (INSY 3600) Engineering Economic Analysis
  (INSY 3700) Operations Planning & Control

- Credit Hours: 3
- Course Website: Maintained on Blackboard.
- Lectures: Tues. & Thur. 9:30 - 10:45 am

2009 Catalog Description: The AU Bulletin description is “Design and operation of manufacturing systems. Models to design, analyze, operate, and control manufacturing systems. Facility layout and location models.”

Required Material:
- Calculator Policy: To avoid academic dishonesty, students are not to have calculators that store text and/or can connect to Bluetooth devices during class. The only calculators acceptable for in-class exams or quizzes are: TI-30XA, TI-30XIIB, and TI-34II.

Course Learning Outcomes: Students should be able to develop a general understanding of the basic concepts and practical models in manufacturing system analysis and design, and be able to apply these concepts and models in the design and evaluation of basic manufacturing systems.

Grading Policy: Late homework will be penalized by 20% per day. You must average 55% or above on the three exams in order to pass the class. The following is a description of how grades will be calculated.

Weighted grades on homework assignments, projects, quizzes, and exams will be based on the following scale:

Homework Assignments, 4 --- 10%
Programming Project          October 29th 10%
Quiz I (Homework 1)           September 15th 5%
Quiz II (Homework 3)          November 12th 5%
Midterm                      October 8th 30%
Final Exam                   December 15th 40%

Final course grades will be determined based on the following scale:
Student’s Final Average ≥ 90 % A
Student’s Final Average ≥ 80 % B
Student’s Final Average ≥ 70 % C
Student’s Final Average ≥ 60 % D
Student’s Final Average < 60 % F

Topics Covered:

<table>
<thead>
<tr>
<th>Duration</th>
<th>Lecture Topics</th>
<th>Duration</th>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Production Systems</td>
<td>Week 8</td>
<td>Software &amp; Assembly Line Balancing</td>
</tr>
<tr>
<td>Week 1</td>
<td>Globalization</td>
<td>Weeks 8 - 9</td>
<td>Automated Production Lines</td>
</tr>
<tr>
<td>Week 2</td>
<td>Manufacturing Operations</td>
<td>Week 9</td>
<td>Automated Assembly Systems</td>
</tr>
<tr>
<td>Weeks 2 - 3</td>
<td>Mathematical Models</td>
<td>Week 10</td>
<td>Cellular Manufacturing</td>
</tr>
<tr>
<td>Weeks 3 - 4</td>
<td>Facility Layout and Design</td>
<td>Week 11</td>
<td>Flexible Manufacturing Systems</td>
</tr>
<tr>
<td>Week 5</td>
<td>Manufacturing Systems</td>
<td>Week 11</td>
<td>Job Shop Scheduling</td>
</tr>
<tr>
<td>Week 5</td>
<td>Single Station Cells</td>
<td>Week 12</td>
<td>Benchmarking &amp; Standardization</td>
</tr>
<tr>
<td>Week 6</td>
<td>Single Station Scheduling</td>
<td>Weeks 12 - 13</td>
<td>Material Transport &amp; Storage Systems</td>
</tr>
<tr>
<td>Weeks 6 - 7</td>
<td>Manual Assembly Lines</td>
<td>Week 14</td>
<td>Introduction to Automation</td>
</tr>
<tr>
<td>Week 7</td>
<td>RFID Technology</td>
<td>Week 15</td>
<td>Manufacturing Management</td>
</tr>
</tbody>
</table>

ABET Outcomes:

(c) An ability to design a system, component, or process to meet desired needs
- Students design an “optimized” facility layout based on product traffic flow, process areas, and facility constraints.
- Students design and analyze an automated storage system based on physical dimensions, servicing times, and transfer speeds
- Students design a station sequencing process based on production rates, process cycle times, and process sequence requirements.

(g) An ability to communicate effectively
- Grades on presentations of a team project where students must complete a basic manufacturing systems engineering problem.

Syllabus Prepared by: John L. Evans
Date: 8-17-09
INSY 4800: Senior Design
(Required for B.I.S.E.)

Department of Industrial & Systems Engineering
Spring 2010

Instructor: Dr. Kevin R. Gue
E-mail: kevin.gue@auburn.edu
Office: Shelby Center 3314
Office Hours: Wed. 1:00 – 3:00 pm

- Prerequisites: (INSY 3021) Methods Engineering, Work Measurement & Lab
  (INSY 4700) Manufacturing Systems
- Credit Hours: 3
- Course Website: Maintained on Blackboard.
- Lectures: Mon. 2:00-4:30 pm (Shelby 1103) & Thur. 3:30-4:15 pm (Shelby 1126)

2009 Catalog Description: Capstone course in which undergraduate course-work
principles are brought to bear upon a design problem in a cooperating industry or institution.

Required Material:

Course Learning Outcomes: To prepare students to effectively apply industrial and
systems engineering techniques and the engineering design process to real industrial problems,
improve oral and written communication skills, and give students experience working in teams.

Grading Policy:
- Graded events receive a numerical score, according to the following convention: A “high A”
is assigned a score between 97-99%, an “A” between 94-96%, a “low A” between 90-94%,
and so on. Any numerical score below 60% is failing.
- The proposal event is comprised of an oral presentation and two written documents. The oral
presentation will be graded on an individual basis, and is worth 10% of the final grade. The
proposal documents are graded on a group basis, and are also worth 10% of the final grade.
Groups should work with their advisors to clarify expectations.
- The defense event is comprised of an oral presentation and two written documents. The oral
presentation is graded on an individual basis and is worth 40% of the final grade. The final
written documents will be graded on a group basis and are worth 40% of the final grade. The
final written documents must also include a separate presentation poster.
- Team evaluations: Each student will submit an evaluation of all group members, including
him- or herself. The advising team will use these evaluation forms when assigning final
grades.
- All groups are required to contribute to and participate in a Capstone Poster Session on Dead
Day. Project sponsors will be invited to this session for interaction with the groups.
Participation in this event is mandatory.
### Topics Covered:

<table>
<thead>
<tr>
<th>Lecture Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
</tr>
<tr>
<td>Working in Teams</td>
</tr>
<tr>
<td>Writing proposals</td>
</tr>
<tr>
<td>Making presentations</td>
</tr>
<tr>
<td>Proposal presentations</td>
</tr>
<tr>
<td>Working with clients</td>
</tr>
<tr>
<td>Writing final reports</td>
</tr>
<tr>
<td>Final Project presentations</td>
</tr>
</tbody>
</table>

### ABET Outcomes:

<table>
<thead>
<tr>
<th>(d)</th>
<th>An ability to function on multi-disciplinary teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>(g)</td>
<td>An ability to communicate effectively</td>
</tr>
<tr>
<td>(l)</td>
<td>Be able to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.</td>
</tr>
<tr>
<td>(m)</td>
<td>Be able to integrate systems using appropriate analytical, computational and experimental practices.</td>
</tr>
</tbody>
</table>

### Assessments:

- **(d)** An ability to function on multi-disciplinary teams
  - The mid-term oral and report reflects the team's (composed of ISE students) ability to interact with various departments and individuals from other fields while gathering data and developing their project for the company.

- **(g)** An ability to communicate effectively
  - Presentation of proposal. Must adhere to time limit, must be clear, concise. All group members must present and decide (in advance) how to divide the presentation. Assessment on (a) adhering to time limit, (b) clarity of slides, (c) comprehensive coverage of the proposed project.

- **(l)** Be able to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.
  - Final written project report regarding consideration of people aspects of project. This might include safety, work measurement, training, fixtures and work aids, number of workers, etc. Metric - for each project, did the group consider the relevant people aspects of their technical project and integrate these considerations into their proposed solution/design?

- **(m)** Be able to integrate systems using appropriate analytical, computational and experimental practices.
  - The students discuss in their final written report how they integrated each system and the effect on the project.

**Syllabus Prepared by:** Kevin R. Gue  
**Date:** 12/10/2009
APPENDIX B. FACULTY RESUMES

J T. BLACK
Professor Emeritus
3301J Shelby Center
Phone: (334) 844-1375, Fax: (334) 844-1381
E-mail: blackjt@eng.auburn.edu

EDUCATION

- 1969 - Ph.D., Mechanical and Industrial Engineering, University of Illinois, Urbana
- 1963 - M.S., Industrial Engineering, West Virginia University
- 1960 - B.S., Industrial Engineering, Lehigh University

EXPERIENCE
Years of experience at Auburn: 26

- 1998 - Present: Professor Emeritus, Industrial and Systems Engineering, Auburn University
- 1984 - 1998: Professor, Industrial and Systems Engineering, Auburn University
- 1981 - 1984: Chairman and Professor, Industrial and Systems Engineering, The University of Alabama-Huntsville
- 1976 - 1981: Professor/Associate Prof., Industrial and Systems Eng., The Ohio State University
- 1972 - 1975: Associate Professor, Industrial Engineering, University of Rhode Island
- 1970 - 1972: Assistant Professor, Mechanical Engineering, University of Vermont
- 1969 - 1970: Assistant Professor, Center for Electron Microscopy, University of Illinois
- 1960 - 1965: Instructor, Industrial Engineering, West Virginia University

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- 1975 - Present: Society of Manufacturing Engineers
- 1972 - Present: Institute of Industrial Engineering
- 1970 - Present: American Society of Mechanical Engineers

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 2004 - Present: Editor-in-chief Journal of Manufacturing Systems - SME

HONORS AND AWARDS

- 2007: IIE Lean Teacher of the year.
- 2004: SME Education Award – for developing manufacturing engineering curricula.
• 1998: Fellow - Society of Manufacturing Engineers.

SELECTED PUBLICATIONS

• Payton, L. N., Black, J T, "Orthogonal Machining of Copper with a Hardness Gradient", NAMRC, May. 2002.
EDUCATION

- 1975 - Ph.D., Industrial Engineering, Georgia Institute of Technology
- 1972 - MS, Operations Research, Georgia Institute of Technology
- 1968 - BISE, Industrial Engineering, Georgia Institute of Technology

EXPERIENCE

Years of experience at Auburn: 30

- 1980 - Present: Professor, Department of Industrial & Systems Engineering, Auburn University
- 1975 - 1980: Associate Professor, Department of Systems & Industrial Engineering, University of Arizona
- 1968 - 1970: Industrial Engineer, Department of Industrial Engineering, Celanese Fibers Company

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- 1992 - Present: Production & Operations Management Society
- 1975 - Present: Institute of Industrial Engineers
- 1971 - Present: INFORMS

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 1999 - Present: Business, Engineering and Technology Faculty -
- 1999 - 2008: Graduate Program Officer -

HONORS AND AWARDS

- 2000: Thomas Walter Professor of Technology Management - Auburn University.
- 1974: Fellowship - National Science Foundation.

PROFESSIONAL DEVELOPMENT ACTIVITIES

- 1993 - 1993: Sabbatical - Georgia Institute of Technology

RESEARCH INTERESTS
• Dr. Bulfin's research interests are in developing solution techniques that can be applied to problems in the real world. The work has consisted of defining problems, developing models, and determining solution procedures for these models. Some specific applications include allocating fuels in copper production, determining the best use of safety funds, and scheduling in a variety of situations.

APPLICATIONS

• Energy allocation, personnel scheduling

EXAMPLES OF FUNDING SOURCE

• NASA, DoD, DoT, USAID

SELECTED PUBLICATIONS

JERRY DAVIS
Associate Professor
3310 Shelby Center
Phone: (334) 844-1424, Fax: (334) 844-1381
E-mail: davisga@auburn.edu
Website: http://www.eng.auburn.edu/~davisga/

EDUCATION
- 2001 - Ph.D., Industrial and Systems Engineering, Auburn University
- 1996 - MS, Industrial and Systems Engineering, Auburn University
- 1988 - BS, Mechanical Engineering, University of South Carolina

EXPERIENCE
Years of experience at Auburn: 9
- 2009 - Present: Associate Professor, Industrial and Systems Engineering, Auburn University
- 2005 - Present: Assistant Professor, Industrial and Systems Engineering, Auburn University
- 2001 - 2005: Research Assistant Professor, Industrial and Systems Engineering, Auburn University
- 1988 - 1998: Engineering/Weapons Officer, USS Rhode Island SSBN 740 & USS Tecumseh SSBN 628, United States Naval Nuclear Submarine Force

SCIENTIFIC AND PROFESSIONAL SOCIETIES
- 2001 - Present: American Society of Safety Engineers (ASSE)
- 2001 - Present: Institute of Industrial Engineers (IIE)

INSTITUTIONAL AND PROFESSIONAL SERVICES
- 2003 - Present: College of Engineering Safety Project - Project Director

HONORS AND AWARDS
- 2005: Outstanding Faculty Member, Graduate School - Student Government Association - Auburn University.
- 2003: Industrial and Systems Engineering Outstanding Faculty Member - Auburn University.
- 2001: College of Engineering Outstanding Doctoral Student - Auburn University.
PROFESSIONAL DEVELOPMENT ACTIVITIES

- 2004 - Present: Certified Safety Professional (CSP)
- 2004 - Present: OSHA Authorized Trainer - General Industry - *Occupational Safety*
- 2003 - Present: Certified Professional Ergonomist (CPE)

RESEARCH INTERESTS

- Safety and Ergonomics Litigation.
- Human Factors, Occupational Safety & Ergonomics.

SELECTED PUBLICATIONS


CONSULTING EXPERIENCE

TOM DEVALL  
Director of Automotive Manufacturing Initiatives  
3301E Shelby Center, Auburn, AL 36849-5346  
Phone: (334) 844-2351, Fax: (334) 844-1381  
E-mail: devall@auburn.edu

EDUCATION

- 1988 - MAS, Business, University of Alabama - Huntsville  
- 1983 - BBA, Business, Eastern Michigan University

EXPERIENCE

Years of experience at Auburn: 0

- 2010 - Present: Director of Automotive Manufacturing Initiatives, Industrial and Systems Engineering, Samuel Ginn College of Engineering  
- 2007 - 2010: Vice President of Manufacturing, Manufacturing, Teledyne Continental Motors  
- 1995 - 2007: Area Manager Manufacturing, Manufacturing, DaimlerChrysler  
- 1984 - 1989: Manufacturing Supervisor, Manufacturing, Chrysler

PROFESSIONAL DEVELOPMENT ACTIVITIES

- 2009 - 2010: Lean Six Sigma Black Belt

RESEARCH INTERESTS

- Manufacturing Management Systems: Design and implement a metrics driven management system which responds to top indicators. Properly implemented, this system will provide healthy organizational pressure to align limited resources thus assuring an optimal continuous improvement culture. Problem solving tools are assumed. This initiative focuses on the management systems which drive problem solving activity.
JOHN L. EVANS
Thomas Walter Professor
3308 Shelby Transportation Center
Phone: (334) 844-1418, Fax: (334) 844-1381
E-mail: jevans@eng.auburn.edu

EDUCATION

• 1991 - Ph.D., Manufacturing Systems Engineering, University of Alabama Huntsville
• 1987 - MSE, Engineering Management, University of Alabama Huntsville
• 1984 - BEE, Electrical Engineering, Auburn University

EXPERIENCE

Years of experience at Auburn: 9

• 2009 - Present: Thomas Walter Professor, Industrial and Systems Engineering, Auburn University
• 2001 - 2009: Associate Professor, Industrial and Systems Engineering, Auburn University
• 2000 - 2001: Manager, Strategic Business & Advanced Technology, Huntsville Electronics, DaimlerChrysler
• 1998 - 2000: Manager, Advanced Technology Engineering, Huntsville Electronics, DaimlerChrysler
• 1994 - 1998: Supervisor, Advanced Electronics Packaging & Sys, Advanced Technologies Engineering, Chrysler Corp Huntsville Electronics Division
• 1991 - 1994: Technology Specialist, Advanced Technologies Engineering, Chrysler Corp Huntsville Electronics Division
• 1990 - 1991: Senior Business Analyst, Powertrain Business Group, Chrysler Corp - Acustar
• 1988 - 1990: Financial Specialist, Pricing and Finance, Chrysler Corp - Acustar Division
• 1986 - 1988: Lead Engineer, Product Engineering, Chrysler Corp - Huntsville
• 1984 - 1988: Design Engineer, Product Engineering, Chrysler Corp. Huntsville

SCIENTIFIC AND PROFESSIONAL SOCIETIES

• 2002 - Present: Institute of Industrial and Systems Engineering (IIE)
• 2001 - Present: Institute of Electrical & Electronics Engineering (IEEE)
• 1999 - Present: Surface Mount Technology Association (SMTA)

INSTITUTIONAL AND PROFESSIONAL SERVICES

• 2003 - Present: Conference Chair - Harsh Environment Conference - SMTA/CAVE
• 2001 - Present: Technical Committee - SMTA
• 2001 - Present: Track Chairman - SMTA International Conference - SMTA
• 2001 - Present: Associate Director - Center for Advanced Vehicle Electronics (CAVE)

HONORS AND AWARDS

• 2009: Luminary of SMTA - Surface Mount Technology Association.
2000: Distinguished Young Engineering Alumni - University of Alabama Huntsville.

RESEARCH INTERESTS

- Developing an automotive engineering education program for the expanding Southeastern US Manufacturing base.
- Investigating next generation electronics packaging and manufacturing technologies needed for the advanced electronics industry.

SELECTED PUBLICATIONS


PATENTS

KEVIN GUE
Associate Professor
3314 Shelby Center for Engineering
Phone: (334) 844-1425, Fax: (334) 844-1381
E-mail: kevin.gue@auburn.edu
Website: http://www.kevingue.com

EDUCATION

- 1995 - Ph.D., Industrial Engineering, Georgia Tech
- 1992 - MS, Operations Research, Georgia Tech
- 1985 - BS, Mathematics, U.S. Naval Academy

EXPERIENCE
Years of experience at Auburn: 6

- 2004 - Present: Associate Professor, Industrial & Systems Engineering, Auburn University
- 1995 - Present: Associate Professor, Graduate School of Business & Public Policy, Naval Postgraduate School
- 1990 - 1995: Graduate Student, Industrial & Systems Engineering, Georgia Tech
- 1985 - 1990: Officer, U.S. Navy

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- College-Industry Council on Material Handling Education
- Institute for Industrial Engineers (IIE)
- Institute for Operations Research & Management Science (INFORMS)

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 2008 - 2009: Chair - Facility Logistics SIG, INFORMS
- 2006 - 2007: President - College-Industry Council on Material Handling Education

HONORS AND AWARDS

- 2010: ISE Faculty Member of the Year - Auburn University.
- 2010: Best Applied Paper, IIE Transactions - Institute of Industrial Engineers.
- 2009: Technical Innovation in Industrial Engineering Award - Institute of Industrial Engineers.
- 2003: Louis D. Liskin MBA Faculty Award - Naval Postgraduate School.
RESEARCH INTERESTS

- Logistics modeling and optimization, including distribution, transportation, warehousing, and material handling

SELECTED PUBLICATIONS

SAEED MAGHSOODLOO  
Professor Emeritus  
3301H Shelby Center  
Phone: (334) 844-1405, Fax: (334) 844-1381  
E-mail: maghsood@eng.auburn.edu  
Website: http://www.eng.auburn.edu/~maghsood/homepage.html

EDUCATION

- 1968 – Ph.D., Applied Statistics, Auburn University  
- 1963 – MS, Applied Mathematics, Auburn University  
- 1962 – BS, Physics, Auburn University

EXPERIENCE

Years of experience at Auburn: 43

- 1984 - Present: Professor, Industrial & Systems Engineering, Auburn University  
- 1976 - 1984: Associate Professor, Industrial Engineering, Auburn University  
- 1969 - 1976: Assistant Professor, IE Department, Auburn University  
- 1968 - 1969: Assistant Professor, Mathematics Department, East Tennessee State University  
- 1966 - 1968: Instructor, IE Department, Auburn University

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- Associate Editor for IIE Transactions  
- Associate Editor of the Journal of Manufacturing Systems  
- Member, IIE  
- Member ASQC  
- On the Editorial Board of Quality and Reliability Engineering of IIE Transactions

INSTITUTIONAL AND PROFESSIONAL SERVICES

- None -

HONORS AND AWARDS

- Auburn University.  
- Auburn University.

PROFESSIONAL DEVELOPMENT ACTIVITIES

- None

RESEARCH INTERESTS
- Statistical Quality control, Taguchi Methods, and Multivariate analysis

SELECTED PUBLICATIONS

EDUCATION

- 1977 - Ph.D., Industrial Engineering, Georgia Institute of Technology
- 1973 - MSIE, Industrial Engineering, Purdue University
- 1969 - BS, Ceramic Engineering, Hanyang University

EXPERIENCE

Years of experience at Auburn: 29

- 2004 - Present: Ginn Distinguished Professor of Engineering, Industrial & Systems Engineering, Auburn University
- 1996 - 2003: Professor, Industrial & Systems Engineering, Auburn University
- 1982 - 1988: Associate Professor, Industrial & Systems Engineering, Auburn University
- 1980 - 1982: Assistant Professor, Industrial & Systems Engineering, Auburn University
- 1980 - 1980: Systems Analyst, Naval Equipment Training Center, Department of U.S. Navy
- 1977 - 1980: Assistant Professor, Industrial Engineering & Management Systems, University of Central Florida
- 1977 - 1977: Instructor, School of Industrial & Systems Engineering, Georgia Institute of Technology
- 1970 - 1971: Assistant Manager, Seoul Branch Office, Marubeni-ida Corporation
- 1969 - 1970: Production Engineer, Asahi Electrical Insulators Mfg

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- 2004 - Present: IEEE Power Systems
- 1977 - Present: Institute of Industrial Engineers

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 2004 - Present: Editor-in-Chief Emeritus - The Engineering Economist
HONORS AND AWARDS

• 2003: Samuel Ginn Distinguished Professor of Engineering - Auburn University. *Endowed Professorship from College of Engineering*
• 2001: Fellow Award - Institute of Industrial Engineers.
• 2001: Wellington Award - Institute of Industrial Engineers. *Outstanding contributions and service in the field of Engineering Econ*
• 1991: Alumni Professorship - Auburn University.
• 1991: Outstanding Publication Award - Institute of Industrial Engineers. *The best publication in any of the journals published by the IIE*
• 1990: The 1990 Eugene L. Grant Award - American Society of Engineering Education.
• 1980: Faculty Research Award - University of Central Florida.
• 1977: Outstanding Dissertation Award - Sigma Xi, Georgia Institute of Technology.

RESEARCH INTERESTS

• Financial Engineering
• Real Options (Strategic Investment Decisions under Uncertainty)
• Pricing Transmission Congestions (Power Economics and Energy Modeling)

SELECTED PUBLICATIONS


CONSULTING EXPERIENCE

• 2002 - 2003: *Feasibility Study of Plant Location* - Hyundai Corporation
• 2002 - 2003: *Engineering Economics* - National Center for Continuing Education

REGISTERED PROFESSIONAL ENGINEER

• State of Florida
EDUCATION

- 2003 - PhD, Industrial and Operations Engineering, The University of Michigan
- 1997 - MS, Industrial Engineering, POSTECH
- 1995 - BS, Industrial Engineering, POSTECH

EXPERIENCE

Years of experience at Auburn: 0

- 2010 - Present: Assistant Professor, Industrial and Systems Engineering, Auburn University

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- Human Factors and Ergonomics Society
- Society of Automotive Engineers

RESEARCH INTERESTS

- Design Ideation
- Occupational Biomechanics
- Digital Human Modeling
- Design for Large Individuals
- Physical Man-Artifact System Design

SELECTED PUBLICATIONS

LEWIS N PAYTON, PH.D.
Director, Design and Manufacturing Laboratory, 270 Ross Hall
Phone: (334) 844-3315, Fax: (334) 844-3422
E-mail: payton@auburn.edu

EDUCATION
- 2002 - PhD, Industrial and Systems Engineering, Auburn University
- 2000 - MS, Industrial and Systems Engineering, Auburn University
- 1979 - B.S., Physics, Auburn University

EXPERIENCE
Years of experience at Auburn: 82007 - Present: Director, Design and Manufacturing Laboratory, Associate Research Professor, MECH Engineering, Auburn University, Alabama
- 2005 - 2007: Assistant Research Professor, Industrial and Systems Engineering, Auburn University, Alabama
- 2003 - 2005: Research Scientist and Faculty Instructor, Department of Mechanical Engineering, Auburn University, Alabama
- 2002 - 2002: Research Fellow, Marshal Space Flight Center, National Aeronautics and Space Administration
- 2002 - 2003: Post Doctoral Research Assistant, Department of Materials Engineering, Auburn University, Alabama
- 2000 - 2002: Graduate Research Assistant (PhD), Industrial and Systems Engineering, Auburn University, Alabama
- 1996 - 2000: Associate Professor of Naval Science, Naval ROTC, Auburn University, Alabama
- 1979 – 1996: Various Positions, United States Navy

SCIENTIFIC AND PROFESSIONAL SOCIETIES
- 2008 - 2009: American Society of Mechanical Engineers (ASME)
- 2008 - 2009: Institute of Industrial Engineers (IIE)
- 2004 - 2008: American Society of Safety Engineers (ASSE)
- 2003 - 2007: Society of Automotive Engineers (SAE)
- 2003 - 2008: Society of Welding Engineers
- 2003 - 2008: The Navy League of the United States
- 2002 - 2009: Society of Manufacturing Engineers (SME)

HONORS AND AWARDS

PROFESSIONAL DEVELOPMENT ACTIVITIES
- 2009 - Present: Advanced Composite Boats - SBIR N6555-09-M0073 Naval Sea Systems Command with Kennon Products
• 2005 - 2005: Evolutionary Design of FEM for Biomechanics - *Invited speech, Southern Consortium for Injury Biomechanics*

RESEARCH INTERESTS

SELECTED PUBLICATIONS

CONSULTING EXPERIENCE
• 2007 - Present: *Various (Automotive, Occupational and Manufacturing Safety Issues)* - Engineering Institute, Fayetteville, Arkansas

PATENTS
EDUCATION

- 1999 - Ph.D., Mechanical Engineering: Ergonomics & Safety, University of Utah
- 1998 - MPH, Public Health: Occupational Safety & Health, University of Utah
- 1990 - MS, General Engineering: Concentration: Ergonomics, University of Illinois (Urbana-Champaign)
- 1988 - BS, General Engineering: Concentration: Human Factors, Univ. of Illinois (Urbana)
- 1988 - BS, Engineering Psychology, University of Illinois (Urbana-Champaign)

EXPERIENCE

Years of experience at Auburn: 1

- 2009 - Present: Assistant Professor, Industrial and Systems Engineering, Auburn University
- 1999 - 2009: Research Assistant Professor, Mechanical Engineering, University of Utah
- 1994 - 1999: Doctoral Candidate, RA/TA, Mechanical Engineering, University of Utah
- 1992 - 1994: Safety Engineer, Michelin Tire Corporation
- 1990 - 1992: Safety Engineer, Georgia Tech Research Institute

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- 2009 - Present: Institute of Industrial Engineers
- 1994 - Present: American Society of Safety Engineers
- 1994 - Present: Human Factors and Ergonomics Society

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 2010 - Present: Faculty Advisor to Auburn Student Chapter - Human Factors and Ergonomics Society
- 2010 - Present: Faculty Advisor to Auburn Student Chapter - American Society of Safety Engineers
- 2009 - Present: Member, Structural Modifications Committee - Auburn University Structural Modifications Comm.
- 2007 - 2009: College of Engineering Safety Officer - University of Utah, College of Engineering
- 2000 - 2009: College of Engineering Safety Committee - University of Utah, College of Engineering
HONORS AND AWARDS

- 2008: Student Choice Teaching Award - University of Utah, ASUU. *1 of 6 campus wide*
- 1988: Phi Kappa Phi Honor Society - University of Illinois (Urbana-Champaign).
- 1988: Tau Beta Pi Honor Society - University of Illinois (Urbana-Champaign).

PROFESSIONAL DEVELOPMENT ACTIVITIES

- 2009 - Present: Biggio Center New Faculty Scholars Program

RESEARCH INTERESTS

- Industrial ergonomics, human factors engineering, engineering psychology, safety engineering, biomechanics, ergonomic modeling and ergonomic survey tools, occupational safety and health standards and compliance.

SELECTED PUBLICATIONS

LUANN SIMS  
Academic Advisor & Instructor  
3301C Shelby Center  
Phone: (334) 844-1430, Fax: (334) 844-1381  
E-mail: simslua@auburn.edu

EDUCATION

- 1978 - MS, Industrial & Systems Engineering, Georgia Institute of Technology
- 1975 - Bachelor of Eng Econ Syst, Industrial & Systems Engineering, Georgia Institute of Technology

EXPERIENCE

Years of experience at Auburn: 7

- 2005 - Present: Academic Advisor & Instructor, Industrial and Systems Engineering, Auburn University
- 2003 - Present: Instructor, Industrial and Systems Engineering, Auburn University
- 2000 - Present: Adjunct Instructor, Computer Information Systems, Southern Union State Community College
- 1980 - 1983: Supervisor, Production Engineering, Datapoint Corporation
- 1979 - 1980: Engineer, Engineering, Industrial Handling Engineers, Inc.
- 1977 - 1979: Assistant Research Engineer, Engineering, Georgia Tech Experiment Station

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- 2003 - Present: Institute of Industrial Engineers

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 2010 - Present: Regional Vice President - Southeast Region - Institute of Industrial Engineers
- 2008 - 2010: Assistant VP for Student Development - Institute of Industrial Engineers

PROFESSIONAL DEVELOPMENT ACTIVITIES

- 2008 - Present: PhD Student - Industrial and Systems Engineering
- 2008 - Present: 30 Hour OSHA Card
- 2006 - Present: ABET Evaluator
- 2005 - Present: Advisor for IIE Student Chapter
ALICE E. SMITH  
Professor and Chair  
3301 Shelby Center  
Phone: (334) 844-1400, Fax: (334) 844-1381  
E-mail: smithae@auburn.edu  
Website: http://www.eng.auburn.edu/~aesmith

EDUCATION

- 1991 - PhD, Engineering Management, Missouri University of Science and Technology
- 1988 - MBA, Business Administration, Saint Louis University
- 1979 - BSCE, Civil Engineering, Rice University

EXPERIENCE

Years of experience at Auburn: 11

- 1999 - Present: Professor and Chair, Industrial & Systems Engineering, Auburn University
- 1996 - 1999: Associate Professor, Industrial Engineering, University of Pittsburgh
- 1991 - 1996: Assistant Professor, Industrial Engineering, University of Pittsburgh
- 1979 - 1989: Various, Engineering, Southwestern Bell Corporation

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- 1991 - Present: ASEE
- 1991 - Present: IIE
- 1991 - Present: INFORMS
- 1987 - Present: IEEE
- 1977 - Present: SWE

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 2010 - Present: Chair, Council of IE Department Heads - CIEADH
- 2009 - 2010: Secretary, Council of IE Department Heads - CIEADH
- 2005 - Present: Associate Editor - Computers & Operations Research
- 2004 - Present: Associate Editor - International Journal of General Systems
- 2002 - 2005: Educational Foundation Board - IIE
- 1998 - Present: Associate Editor - IEEE Transactions on Evolutionary Computation
- 1996 - 2008: Editorial Board - IIE Transactions
- 1995 - Present: Associate Editor - INFORMS Journal on Computing

HONORS AND AWARDS

- 2009: Women in OR/MS Award - INFORMS.
- 2006: Grant Best Paper Award - The Engineering Economist.
- 2005: ASEE Best Regional Paper Finalist - ASEE.
2003: Fellow - IIE.
2003: Golomski Best Paper Award - RAMS / IIE.
2001: Philpott-WestPoint Stevens Professorship - Auburn University.
2001: Senior Research Award - Auburn University.
2001: ADVANCE Leadership Grant - National Science Foundation.
1999: Grant Best Paper Award - The Engineering Economist.
1995: CAREER Grant - National Science Foundation.

RESEARCH INTERESTS

- Modeling, analysis and optimization of complex manufacturing and engineering design systems using computational intelligence (artificial neural networks, evolutionary algorithms and fuzzy systems) combined with techniques from probability and statistics and from operations research. Primary application areas include manufacturing process control, design of reliable networks, advanced materials microstructure, facilities design and economic modeling.

SELECTED PUBLICATIONS


PATENTS


REGISTERED PROFESSIONAL ENGINEER

- State of Alabama
- State of Pennsylvania
JEFFREY S. SMITH  
Professor  
3301 Shelby Center  
Phone: (334) 844-1412, Fax: (334) 844-1381  
E-mail: jsmith@auburn.edu

EDUCATION

- 1992 - Ph.D., Industrial Engineering, Penn State University  
- 1990 - MS, Industrial Engineering, Penn State University  
- 1986 - BS, Industrial Engineering, Auburn University

EXPERIENCE

Years of experience at Auburn: 11

- 2003 - Present: Professor, Industrial and Systems Engineering, Auburn University  
- 1999 - 2003: Associate Professor, Industrial and Systems Engineering, Auburn University  
- 1998 - 1999: Associate Professor, Industrial Engineering, Texas A&M University  
- 1992 - 1998: Assistant Professor, Industrial Engineering, Texas A&M University  
- 1988 - 1992: Graduate Research Assistant, Industrial and Manufacturing Engineering, Penn State University  
- 1987 - 1988: Industrial Engineer, Philip Morris U.S.A.  

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- 1988 - Present: Institute of Industrial Engineers

INSTITUTIONAL AND PROFESSIONAL SERVICES

- 2010 - Present: Board of Directors - Winter Simulation Conference  
- 2010 - Present: President - College Industry Council on Material Handling Education  
- 2002 - 2005: Presidential Membership Commission - Institute of Industrial Engineers

HONORS AND AWARDS

- 2007: Outstanding INSY Faculty Award - Auburn University.  
- 2005: Outstanding INSY Faculty Award - Auburn University.  
- 1998: Best Publication Award - Institute of Industrial Engineers.

RESEARCH INTERESTS
• Manufacturing systems design and analysis
• Discrete event simulation

SELECTED PUBLICATIONS


CONSULTING EXPERIENCE

• 2006 - 2008: Picking Area Layout - Biohorizons, Inc.
• 2005 - Present: Scheduling Tennis Umpires - United States Tennis Association
ROBERT E. THOMAS
Professor Emeritus
3301G Shelby Center
Phone: (334) 844-1420, Fax: (334) 844-1381
E-mail: thomare@auburn.edu

EDUCATION

• 1988 - Ph.D, Industrial Engineering, Texas A & M University
• 1972 - MS, Industrial Engineering, Texas A & M University
• 1963 - BIE, Industrial Engineering, Georgia Tech

EXPERIENCE
Years of experience at Auburn: 21

• 2010 - Present: Professor Emeritus, Industrial and Systems Engineering, Auburn University
• 2004 - 2009: Professor, Industrial and Systems Engineering, Auburn University
• 1994 - 2004: Associate Professor, Industrial and Systems Engineering, Auburn University
• 1988 - 1986: Doctoral Student, Industrial Engineering, Texas A & M University
• 1988 - 1994: Assistant Professor, Industrial and Systems Engineering, Auburn University
• 1988 - 1988: Visiting Assistant Professor, Industrial Engineering, Texas A & M University
• 1964 - 1985: Commissioned Officer, US Army
• 1963 - 1964: Industrial Engineer, ALCOA

SCIENTIFIC AND PROFESSIONAL SOCIETIES

• 2000 - Present: American Society of Safety Engineers
• 1995 - Present: American Society of Engineering Education
• 1990 - Present: Alabama Academy of Science
• 1990 - Present: American Industrial Hygiene Association
• 1985 - Present: Human Factors and Ergonomics Society
• 1985 - Present: Institute of Industrial Engineers

INSTITUTIONAL AND PROFESSIONAL SERVICES

• 1995 - Present: Member of Ergonomics Committee - American Industrial Hygiene Association

HONORS AND AWARDS

• 2009: Outstanding Faculty Member Awarded by the Samuel Ginn College of Engineering
• 2004: Outstanding Faculty Member Awarded by the Student Government Association
• 2001: William F. Walker Merit Teaching Award - College of Engineering.
• 1999: Outstanding Faculty Member Awarded by the Student Government Association
• 1999: Fred H. Pumphrey Teaching Award - College of Engineering.
• 1996: Outstanding Faculty Member Awarded By Student Government Association
• 1995: Birdsong Merit Teaching Award - College of Engineering.
• 1992: Outstanding Faculty Member Awarded by the Student Government Association

PROFESSIONAL DEVELOPMENT ACTIVITIES

• 1999 - Present: Annual Interdisciplinary Training Seminars - Conducted in conjunction with UAB

RESEARCH INTERESTS

• General Occupational Safety and Ergonomics, Occupational Biomechanics, Human Factors Engineering, Workplace and Work Area Design

SELECTED PUBLICATIONS


CONSULTING EXPERIENCE

• 2009 - 2010: Special Evaluation Panel - CDC/NIOSH
JORGE VALENZUELA
Associate Professor
3304 Shelby Center
Phone: (334) 844-1407, Fax: (334) 844-1381
E-mail: valenjo@auburn.edu
Website: http://www.eng.auburn.edu/~jvalenz

EDUCATION
- 2000 - Ph.D., Industrial Engineering, University of Pittsburgh
- 1996 - MS, Industrial Engineering, Northern Illinois University
- 1984 - MS, Statistics, CIENES (Chile)
- 1982 - BS, Electrical Engineering, Northern Catholic University (Chile)

EXPERIENCE
Years of experience at Auburn: 10
- 2005 - Present: Associate Professor, Industrial and Systems Engineering, Auburn University
- 2000 - 2005: Assistant Professor, Industrial and Systems Engineering, Auburn University
- 1999 - 2000: Instructor, College of Business Administration, University of Pittsburgh
- 1996 - 1999: Graduate Research Assistant, Industrial Engineering, University of Pittsburgh
- 1995 - 1996: Graduate Research Assistant, Industrial Engineering, Northern Illinois University
- 1985 - 1994: Instructor, Computer and Systems Engineering, Northern Catholic University (Chile)

SCIENTIFIC AND PROFESSIONAL SOCIETIES
- 2000 - Present: INFORMS
- 2000 - Present: Institute of Industrial Engineers

INSTITUTIONAL AND PROFESSIONAL SERVICES
- 2007 - 2007: Chair of the Combined Colloquia - INFORMS
- 2006 - 2008: Chair of the ENRE Section - INFORMS
- 2005 - 2005: Chair of Publicity - INFORMS
- 2004 - 2006: Vice-Chair of the ENRE Section - INFORMS

HONORS AND AWARDS
- 2006: Outstanding Faculty Member, Department of Systems and Industrial Engineering - Auburn University.
- 2006: William Walker Superior Teaching Award - Auburn University.
- 2004: Outstanding Junior Faculty Research Award - Auburn University.
- 2002: Outstanding Faculty Member, Department of Systems and Industrial Engineering - Auburn University.
- 1996: Honor member - Alpha Pi Mu Honor Society.
PROFESSIONAL DEVELOPMENT ACTIVITIES

- 2009 - Present: Sabbatical Leave at Argonne National Laboratory

RESEARCH INTERESTS

- Stochastic modeling and optimization, both theory and applications. My recent research involves game theory and stochastic models for the evaluation of production costs and optimization of electric power generation.

SELECTED PUBLICATIONS


CONSULTING EXPERIENCE

- Southern Company Services, Inc.
- Intergraph Corporation
Appendix C. Lab Equipment

ISE Computer Lab Photos

Teaching Lab: Student View from Rear of the Room

Teaching Lab: Student Workstations
Teaching Lab: Instructor’s Workstation

Working Lab: General View of the Lab
Individual workstation
The Department of Industrial and Systems Engineering at Auburn University allows students to have a basic “hands on” experience with the basic measuring tools of industry in the “Metrology Laboratory” and fundamental machining principles in the Computer Numerical Controls (CNC) and Robotics laboratory. The following pages show the labs and some* of the equipment located within the two laboratories.

*It is impractical to display all of the INSY equipment here due to the large amount of equipment in the lab. This report conveys the major pieces of equipment as well as unique areas of emphasis in the laboratory.
Electronic Measurement: Various Oscilloscopes, Capacitive Converters and digital printout units are available for the capture of data from both analog and digital sources.
Cincinnati Horizontal Milling Machine: This horizontal milling machine has been used extensively by Dr. J Black to enable studies of Orthogonal Plate Machining. The machine is also used by students to learn rudimentary milling skills such as up-milling and down-milling.

This is the most copied machine in the history of Industrial Engineering and the students learn about work holding, fixtures, and jigs using this machine’s standard R8 Collets.
This Modern FANUC style CNC lathe is suitable for all modern CAD/CAM operations. This machine has been used to conduct high speed Orthogonal Tube machining tests, as well as maintenance and student instruction. It is the largest computer controlled lathe on the Auburn University campus as of 2008 and can be used to produce parts for any senior design team at the university.
Surface measuring units are available to measure surface finish prior to and after machining. Defects in surface finish can shorten product life and decrease reliability.
Coordinate Measuring Machine (CMM): If upgraded, this computer controlled profiler can automatically measure a subject and convert measurements into a CAD drawing.
Metrology: The laboratory is fully equipped with standards and tools to instruct and conduct all types of metrological studies. This facilitates experiments and serves at the basis for all the metrology labs taught at the University. The lab is the single largest source of metrological equipment available on the main campus. Below is one of the laser range finders used to measure distances accurately.
Charpy V-Notch machine. This machine is scheduled to be converted into a Specific Horsepower measuring device, pending securing of funding.
EMCO CNC Lathe (above) and DYNA 2400 CNC Mill (below). These mini CNC machines are fully conversant with MASTERCAM and capable of both instruction and production of research parts. They have been used to produce senior design prototype parts in both machined wax and metals. These are the most powerful desktop CNC Machines on the Auburn University campus.
SpectraLIGHT 0200

Two (2) Machining Centers

A tabletop CNC system that fits comfortably into any classroom. This 3-axis machine uses EIA, ISO and Fanuc compatible G and M code programs to cut parts in a variety of materials.

The spectraLIGHT 0200 Machining Center is a desktop portable state-of-the-art CNC system that fits comfortably into the classroom. Similar to larger industrial machines, the spectraLIGHT Machining Center uses EIA, ISO, and Fanuc-compatible G&M code programs to cut parts in a variety of materials. Linear, circular, and helical interpolation, multiple tool programming, and canned cycles are just a few of the programming modes the machine's software supports.

Unit is horsepower limited to wax and aluminum, and limited to instruction only.

Fully conversant with MASTERCAM.
SpectraLIGHT 0400
Two (2) Turning Centers

A tabletop CNC system that fits comfortably into any classroom, this 2-axis slant bed machine uses EIA, ISO and Fanuc compatible G and M code programs to cut parts in a variety of materials. Optional: 8-tool turret.

The spectraLIGHT 0400 Machining Center is a desktop portable state-of-the-art CNC system that fits comfortably into the classroom. Similar to larger industrial machines, the spectraLIGHT Machining Center uses EIA, ISO, and Fanuc-compatible G&M code programs to cut parts in a variety of materials. Linear, circular, and helical interpolation, multiple tool programming, and canned cycles are just a few of the programming modes the machine's software supports.

Horsepower limited. Suitable for instruction only.

Fully conversant with MASTERCAM.
This reciprocating platen test machine is used to demonstrate various fatigue principles in a carefully monitored laboratory experiment featuring Analysis of Variance (ANOVA). A small surface defect made with a “scratch” on the sample surface shortened the life by 70% in the case of the broken sample shown below. This simulates failure of an axle in a car or machine.
Cycles to failure of this American Society for Testing (ASTE) standard teaches the students the importance of standards when meeting testing specifications.

Uniquely modified die machine permits students to run experiments that capture the actual forces used during the punching operations. Piezoelectric crystals mounted in the plunger head send picoamps of current to a measurement rig designed by the student to convert the picoamps into measured forces.

This is a critical “hands on” experiment for the students. It allows students to develop a “feel” for the forming forces in their hands as they watch the forces on attached oscilloscopes.
Teaches the value of *controlled contact area.*
Optical comparator (above), toolmakers digital microscope (below left) and Rockwell Hardness tester (below right) are typical of the advanced measuring capabilities of the laboratory.
# Equipment in the Design and Manufacturing Laboratory

<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Equipment</th>
</tr>
</thead>
</table>
| Engineering Software          | LABVIEW for Data Acquisition  
|                               | MATLAB and MAPLE  
|                               | MASTERCAM for CNC Operations  
|                               | SolidWorks and SolidEdge for CAD  
|                               | Acclaro for Design Definition  |
| Manual Milling Machines       | Milwaukee Horizontal Mill  
|                               | Supermax Vertical Mill  
|                               | Bridgeport Vertical Mill 1  
|                               | Bridgeport Vertical Mill 2  
|                               | Grizzly Vertical Mills 1-12  |
| Manual Engine Lathes          | Southbend Engine Lathe (Large)  
|                               | Sheldon Toolmakers Lathe  
|                               | Monarch Engine Lathe (Large)  
|                               | Kinsey Engine Lathe  
|                               | Jet Engine Lathes 1-12  |
| Drilling Machines             | Sensitive Drill Press 1  
|                               | Sensitive Drill Press 2  
|                               | Grizzly Drill Press 1  
|                               | Grizzly Drill Press 2  |
| Saws                          | Doall Vertical Band Saw  
|                               | Carolina Horizontal Bandsaw  
|                               | Delta Table Saw  
|                               | Scotchman Horizontal Cold Saw  
|                               | Wellsaw Horizontal Bandsaw  |
| Sheet Metal/Tube Formation    | Pipe Bender (Up To Two Inches)  
|                               | Pneumatic Shrinker/Stretcher  
|                               | Jet Punch Box And Pan Break  
|                               | Planishing Hammer  
|                               | English Wheel  
|                               | 12 Ton Pipe Bender  
|                               | Jet Foot Shear  
|                               | Unihydro Shear  
|                               | Niagara Sheet Bender (Up To 12 Feet Long)  
|                               | Diacro Press Break  
<p>|                               | Pexto Sheet Bender  |</p>
<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding</td>
<td>Lincoln Electric Arc Resistance Welder</td>
</tr>
<tr>
<td></td>
<td>Thomsom Spot Welder</td>
</tr>
<tr>
<td></td>
<td>Miller Electric Shopmaster Tig/Mig Welder</td>
</tr>
<tr>
<td></td>
<td>Airco Mig Welder</td>
</tr>
<tr>
<td></td>
<td>Oxyacetylene Welding/Brazing Units</td>
</tr>
<tr>
<td></td>
<td>Doall Saw Blade Welder</td>
</tr>
<tr>
<td></td>
<td>Hypertherm Plasma Torch</td>
</tr>
<tr>
<td></td>
<td>Various Soldering Stations</td>
</tr>
<tr>
<td></td>
<td>Plymovent Welding Ventilation Unit One</td>
</tr>
<tr>
<td></td>
<td>Plymovent Welding Ventilation Unit Two</td>
</tr>
<tr>
<td></td>
<td>Forge Welding Unit</td>
</tr>
<tr>
<td></td>
<td>Large Welding Table With Accessory Clamps</td>
</tr>
<tr>
<td>Grinding</td>
<td>Brown And Sharp Surface Grinder</td>
</tr>
<tr>
<td></td>
<td>Harig Surface Grinder</td>
</tr>
<tr>
<td></td>
<td>Worcester Grinder</td>
</tr>
<tr>
<td></td>
<td>Unity Grinder 1</td>
</tr>
<tr>
<td></td>
<td>Unity Grinder 2</td>
</tr>
<tr>
<td></td>
<td>Abrasive Cutoff Grinder/Saw</td>
</tr>
<tr>
<td>Presses</td>
<td>Wilson 40 Ton Hydraulic Press</td>
</tr>
<tr>
<td></td>
<td>Number 3 Arbor Unit</td>
</tr>
<tr>
<td>Sanding</td>
<td>Small Grizzly Vertical Sanding Unit</td>
</tr>
<tr>
<td></td>
<td>Large Grizzly Horizontal Sanding Unit</td>
</tr>
<tr>
<td></td>
<td>Jet Vertical Sanding Unit</td>
</tr>
<tr>
<td></td>
<td>Oscillating Grizzly Vertical Spindle Sander</td>
</tr>
<tr>
<td></td>
<td>Various Buffers</td>
</tr>
<tr>
<td>Metrology</td>
<td>Various Steel And Marble Surface Plates</td>
</tr>
<tr>
<td></td>
<td>Micrometers, Dial Indicators</td>
</tr>
<tr>
<td></td>
<td>Height Gages</td>
</tr>
<tr>
<td></td>
<td>Threading Gages</td>
</tr>
<tr>
<td></td>
<td>Rockwell Hardness Tester</td>
</tr>
<tr>
<td></td>
<td>Various Comparators And Temperature Indicators</td>
</tr>
<tr>
<td><strong>Functional Area</strong></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Benchwork                                 | Assorted Vises  
Large Variety Of Handtools  
Premium Is Placed On Having All Possible Handtools  
For The Students To Properly Use                                                                 |
| Computer Numerical Controls (CNC) machinery | Haas T12 2 Axis CNC Lathe  
Haas Tm2 4 Axis CNC Lathe  
Mazak Quickturn 10n 2 Axis CNC Lathe  
Cincinnati Arrow 750 3 Axis CNC Mill  
Chevalier Conversational 3 Axis CNC Mill |
| Casting Equipment                         | Lucifer Aluminum Casting Oven (100 Lb Melt)  
Various Microwave Casting Units (Research)                                                                                         |
| Blacksmithing                             | Mankel Forge  
Various Handtools For Forging/Hotwork                                                                                             |
| Heat treatment                            | Blue Heat Treatment Oven For Low Temp Alloys  
Lucifer Heat Treatment Oven For Aluminum  
Lindberg Heat Treatment Oven For Steels                                                                                                                                 |
| Surface Preparation                       | Anodizing (Up To 12 Inch By 12 Inch By 1 Inch Surface Area)  
Powder Coat Painting (Up To 20 Inch SUV Size Wheel)  
Various Surface Prep Tables  
Econoline Sand Blasting Booth                                                                                                           |
| Instrumentation                           | Various Labview Modules To Collect Force Data  
Various Microscopes  
Various Oscilloscopes And Electrical Meters                                                                                           |
<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Equipment</th>
</tr>
</thead>
</table>
| Miscellaneous   | Electrostatic Tap Disintegrator  
Large Hardwork Work Bench Vice Table  
Various Movable Work Tables And Benches  
Large CNC Work Bench Tables  
Motor Lift  
Forklift  
Pallet Jacks  
Handlifts  
Student Project Bins  
Tool Room  
Technical Library  
Teaching/Research Assistant Offices  
Large Rolling Tables To Support Grizzlys  
Various Tool Storage Lockers |


Occupational Safety and Ergonomics Laboratories

The main OSE/IP Laboratories are located in Shelby Center on the third floor. The main research space consists of:

- The OSE/IP Library (Shelby 3323A)
- The Biomechanics Laboratory (Shelby 3325)
- The Human Factors Engineering Laboratory (Shelby 3326)
- The Work Simulation and Gait Laboratory (Shelby Basement)
Overall Laboratory Capabilities: The OSE/IP Ergonomics/Biomechanics, Human Factors, and work simulation/gait laboratories are well equipped with most data collection equipment field-capable for on-site data collection. The labs are capable of motion capture, wireless electromyography (EMG), force measurement, vision tracking, and vibration measurement. In addition, the labs are capable of environmental assessment including noise, temperature, humidity, and illumination. Measurement of subject characteristics is afforded with various strength dynamometers and anthropometry measurement devices. The gait laboratory has a 60-foot walkway with motion capture, force plates, and fall protection system for subjects.

1. The VICON Motion Capture System and Ground Reaction Force Plates

The Vicon MX system is a state-of-art optical motion capture system that captures kinematic data from human motion activities. The human motion data is relayed to a computer where it is represented as position and angle-time profiles based on biomechanical linkage models. The major components of a Vicon MX system are the cameras, the controlling hardware module, the software to analyze and present the data, and a host computer to run the software. Ground Reaction Force Plates record the magnitude and direction of forces applied to the ground (typically by the feet) during physical activities. These force plates can be integrated with the motion capture and EMG systems to allow comprehensive data collection of subject activities. The OSE laboratory uses force plates to measure the physical forces generated during manual materials handling activities (i.e., pushing, pulling, lifting, and lowering) found in occupational settings and to study gait patterns under various conditions. These devices have also been used in conjunction with the Balance Master for occupational fall research.

This equipment can be used in any of the Auburn OSE/IP Laboratories and can be used in the field. It is utilized in various research activities, including biomechanical analyses of manual materials handling activities, gait analyses, postural/motion comfort and discomfort analyses and automotive ergonomics. This equipment is utilized for undergraduate and graduate level courses, including Introduction to Engineering (ENGR 1110), Ergonomics I (INSY 7060) and Ergonomics II (INSY 7070). This equipment was recently used for a senior design project to compare various workstation layouts.
2. Anthropometric Databases and Anthropometry Resources

The OSE/IP laboratories have access to many anthropometry data sources including The CAESAR Anthropometric Database (North American Edition). This extensive database product includes measurements from the entire North American population sample (2,400 male and female subjects, aged 18-65) including demographics (in comma delimited text and Excel spreadsheet formats). This database includes 3-D model scans in addition to traditional 1-D measurements. The camera views from the 3-D scan have been accurately stitched together to provide complete 3-D models of each pose. Scanned poses include standing, relaxed seated, and coverage poses. In addition the database contains 40 traditional (1-D) measurements that were done with a tape measure and caliper. Extracted 1-D measurements using landmarks from the scans - standing and relaxed seated poses are also included (both in comma-delimited text and Excel spreadsheet formats). All measurements are presented in both English and metric units. Several reports are also included that cover protocol of how data were generated for the population of the United States of America (18-65). In addition, the OSE/IP laboratories use anatomical models to help students visualize anatomical structures and understand how anatomical structures limit and constrain motions, particular for individuals with extreme anthropometric characteristics.

This anthropometric database is utilized for various products and work systems design projects and also will be used for undergraduate and graduate level courses, including Ergonomics I (INSY 7060), Ergonomics II (INSY 7070), and Human Factors Engineering (INSY 7080).
3. The Lumbar Motion Monitor

The Lumbar Motion Monitor (LMM) is an exoskeleton attachment that moves in conjunction with an individual’s spinal movements. The LMM collects three-dimensional kinematic data of an individual’s spine as they perform various physical activities and records this data to a computer. The OSE laboratory uses the LMM to gather information about spinal movements that may increase the risk of back injury when performing various occupational tasks.
4. Balance Master

The Balance Master is a portable human balance evaluation system that allows a researcher to: (1) Assess functional limitations in terms of balance control under various conditions, (2) Identify and quantify sensory and motor impairments that may adversely affect balance, (3) Develop efficient clinical pathways and effective treatment/training programs to improve balance stability, (4) Monitor patient progress following an accident of illness that could adversely affect balance, and (5) Document functional outcomes following training or medical treatment. The OSE laboratory uses the Basic Balance Master to study occupational accidents involving falls from elevation. The types of accidents are prevalent in the U.S. construction industry.
5. Wireless Electromyography (EMG) Data Acquisition System

The Noraxaon Wireless Electromyography (EMG) Data Acquisition System amplifies and filters the small bioelectrical signals that are associated with muscle activity during human movement. The OSE laboratory uses the system to evaluate muscle utilization in various occupational activities. Results of the evaluation provide the research with information concerning: (1) what muscles are used to perform the activity, (2) the timing of muscle utilization during the activity, (3) the level of force generated by the muscles during the activity. The system has a data logger that allows use in the field. The system allows eight channels of data collection and is capable of measuring heart rate, body angles, accelerations, and pressures.
The Economical Load and Force System (ELF) is a very simple force measurement system consisting of electronics, a software package, and the FlexiForce model B101 variable resistance sensors. The ELF system is easy to use and cost-effective for various tool and ask analysis applications where force between the fingers and an object is to be measured. The products are also suited for return to work applications and job descriptions where actual job requirements need to be compared to the capabilities of a worker. This equipment is useful for classroom demonstrations and quick collection of data in occupational settings.
Multiple anthropometric and strength measurement devices are available in the Occupational Safety and Ergonomics laboratories. The equipment is used to collect body measurement data needed for human-compatible workstation and equipment design. The hand grip dynamometers and pinch grip gauges give accurate grip strength readings without the subject being able to "feel" the handle move. These measurement devices are used in psychophysical experiments to estimate the manual forces required to perform various manual tasks and to measure subject strength capabilities.

This equipment is utilized in an undergraduate student laboratory exercise for INSY 3021. The objective of this exercise is for the student to gain practical experience in collecting anthropometric data using the appropriate equipment and proper techniques. Furthermore, the students gain an understanding of the application of this information to the design of real world items that people use. They also gain an appreciation for how individual differences in size and capability can impact workstation effectiveness.
Recently, BTE Technologies has donated a functional rehabilitation workplace simulator for use in the OSE/IP Laboratories. This machine is commonly used for Post Offer Employment Testing (POET). It will be housed in the Work Simulation and Gait Laboratory. It will be used to simulate work place tasks and to compare various products, devices, and work methods. This device is capable of simulating various workplace tasks by adjusting the position, direction, and magnitude of force required to move, turn, or manipulate the controls. These devices are commonly used to assess a workers fitness for duty and will be used to familiarize students with workplace POET testing and to simulate workplace tasks for ergonomic studies.
9. Vision Tracking System

The ViewPoint EyeTracker provides a complete eye movement evaluation environment including integrated stimulus presentation, eye movement monitoring, pupil diameter monitoring, and a Software Developer’s Kit (SDK) for communicating with other applications.
ViewPoint EyeTracker™ incorporates several methods that a user can select from to optimize the system for a particular application. It provides three methods of mapping position signals extracted from the segmented video image in EyeSpace™ coordinates to the participant’s point of regard in GazeSpace™ coordinates.

10. Energy Measurement and Heart Rate Monitoring Equipment
Body Sense Media Energy measurement devices are used to estimate the energy requirements of various tasks and to assess the physical demands of workstations and work methods. The Body Sense Media devices measure thermal load, heart rate, and subject movement to provide a more accurate assessment of subject energy expenditures than heart rate alone. Currently, the Polar heart rate monitoring system is used to record cardiovascular effort required to perform various types of manual labor activities in both research and classroom demonstrations. The heart rate monitors are currently used for a student laboratory exercise in INSY 3021. The objective of this lab exercise is for students to gain an understanding of the application of work physiology concepts in the occupational setting. Further, students gain practical experience in data collections techniques, specifically heart rate monitoring and measurement.

11. Seat Pressure Pad
The seat pressure pad system maps and records interface pressures between any two surfaces quickly and accurately. The tactile surface pressure is displayed in real time in terms of its distribution and magnitude. By interpreting the pressure data obtained from the seat pressure pad system, a human factors engineer may determine whether or not seating pressures and support are acceptable. The equipment is currently used in for a student laboratory exercise in INSY 3021. The INSY 3021 students will perform an ergonomic evaluation of various chairs. The class gains experience using a pressure pad to collect objective measures of seating pressure distribution. Additionally, students learn to properly adjust an "ergonomic chair."

12. Disability Awareness Training Aids

A set of four manually powered wheel chairs is maintained within the OSE laboratory. The chairs are used as part of and INSY 3021 laboratory exercise design to teach undergraduates the purpose of the Americans with Disabilities (ADA) Act and how to evaluate a building for ADA compliance. Students take turns sitting in the wheelchair outside a building on the Auburn campus. While sitting in the chair, they try to gain access to a predetermined location within the building. Based on this experience, the students collect relevant data regarding the design of the building and any potential accessibility problems.
Lab Equipment for Electronics Manufacturing Education

These labs are located in Broun Hall (the electrical engineering building), to the south of Shelby Center.

Design

Sun Workstation for PC Board Layout – This station allows students to perform design layouts for test vehicles used in INSY 6970.

Mentor Graphics Layout Software – This software allows the design files to be generated in Gerber format for PC fabrication.

Other software packages available include ORCAD PCB Simulator and AutoCAD Layout Software

Surface Mount Assembly

MPM AP Stencil Printer – Automated solder paste printing process used for printing solder paste in printed circuit boards. For INSY 6970, students are instructed about the screen printing and machine settings for high quality printing. As part of the lab, the students design an experiment to evaluate a series of variables related to the printing process.
GSI SVS 8300 3-D Solder Paste Inspection Machine – Used to evaluate the printing process to provide 3-D measurement of the printing process. This machine is automated and capability of running at high volume speeds.

Asymtek Flux Jetting System – Machine capable of automated flux dispense for advanced component placement.
Assembleon AQ-2 Pick and Place - High volume component placement machine used for placement of all components.
GSM GENESIS pick and placement machine – This machine is new equipment for high volume component pickup and placement for all components.
Viscom VPS 6053 AOI System – Visual inspection machine used for component inspection before and after reflow.
Heller 800 Reflow Oven – 10 Zone reflow oven used to reflow solder paste for the electronics manufacturing process.

Cam/Alot 3700 – Adhesive and Underfill dispense process used for component encapsulation and grid array underfills.
Inspection Test Equipment

Phoenix X-Ray PCBA Analyzer – The machine inspect solder joints from the final assembled PCBs.
SST 3150 Static force vacuum furnace – The machine is used for die attachment during electronics packaging process.

Wire bonding machine – The machine is used for wire bonding during electronics packaging process.
CSZ and Thermotron thermal cycle chambers – The chambers are used for the reliability tests for electronics products in thermal cycle environments.
Tenney and Delta Design temperature chambers – The chambers are used for the reliability tests for electronics products in hot storage environments.
NOTE: A complete Institutional Summary document that addresses each of the items requested for Appendix D (Sections A-N) in the self-study questionnaire can be found in the *College of Engineering’s Self Study* including completed Tables D1-D6 with information from all departments in the College.

The following pages present the information for Tables D1-D6 for the Department of Industrial & Systems Engineering. Please refer to the *College of Engineering’s Self Study* for the complete Institutional Summary.

Table D-1. Programs Offered by Industrial & Systems Engineering
Table D-2. Degrees Awarded and Transcript Designations by Industrial & Systems Engineering
Table D-3. Support Expenditures
Table D-4. Personnel and Students
Table D-5. Program Enrollment and Degree Data
Table D-6. Faculty Salary Data
<table>
<thead>
<tr>
<th>Program Title</th>
<th>Modes Offered</th>
<th>Nominal Years to Complete</th>
<th>Administrative Head</th>
<th>Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control</th>
<th>Submitted for Evaluation</th>
<th>Offered, Not Submitted for Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISE Industrial &amp; Systems Eng</td>
<td>X</td>
<td>4</td>
<td></td>
<td>Dr. Alice Smith</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MISE Industrial &amp; Systems Eng Non-Thesis</td>
<td>X</td>
<td>1.5</td>
<td></td>
<td>Industrial &amp; Systems Engineering</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MS Industrial &amp; Systems Eng Thesis</td>
<td>X</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PhD Industrial &amp; Systems Eng</td>
<td>X</td>
<td>5</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Table D-2. Degrees Awarded and Transcript Designations by Industrial & Systems Engineering

<table>
<thead>
<tr>
<th>Program Title</th>
<th>Modes Offered</th>
<th>Name of Degree Awarded</th>
<th>Designation on Transcript</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial &amp; Systems Engineering</td>
<td></td>
<td><strong>Bachelor of Industrial &amp; Systems Engineering</strong></td>
<td>BISE Industrial &amp; Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>X X</td>
<td>Master of Industrial &amp; Systems Engineering</td>
<td>MISE Industrial &amp; Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>X X</td>
<td>Master of Science</td>
<td>MS Industrial &amp; Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Doctor of Philosophy</td>
<td>PhD Industrial &amp; Systems Engineering</td>
</tr>
</tbody>
</table>
Table D-5. Program Enrollment and Degree Data

Industrial & Systems Engineering

<table>
<thead>
<tr>
<th>Year</th>
<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></td>
<td></td>
<td>FR</td>
<td>SO</td>
<td>JR</td>
</tr>
<tr>
<td>CURRENT</td>
<td>2009</td>
<td>FT</td>
<td>31</td>
<td>43</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>2008</td>
<td>FT</td>
<td>26</td>
<td>29</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>2007</td>
<td>FT</td>
<td>30</td>
<td>43</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2006</td>
<td>FT</td>
<td>28</td>
<td>24</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>2005</td>
<td>FT</td>
<td>20</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
**Appendix E. Curriculum**

**Department of Industrial & Systems Engineering**

**Curriculum Change Log since 2004**

<table>
<thead>
<tr>
<th>No.</th>
<th>Change</th>
<th>Effective Date</th>
<th>Initiator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Change ENGR elective list from ENGR 2010, ENGR 2050, ENGR 2070, ENGR 2200, ENGR 2350, ELEC 3820, MATL 2100, MECH 2110 to ENGR 2050, ENGR 2200, MATL 2100, MECH 2110</td>
<td>Spring 2004</td>
<td>Alice Smith</td>
</tr>
<tr>
<td>2</td>
<td>Change TECH elective list from “All 3000 and above courses in the College of Engineering” to “Any ISE course not required for the major” and COMP 6000, ELEC 3820, ELEC 6150, MATL 3100, MECH 3220, MECH 6510, STAT 6620, STAT 6630</td>
<td>Spring 2004</td>
<td>Alice Smith</td>
</tr>
<tr>
<td>3</td>
<td>Replace COMP 3000 with COMP 1210</td>
<td>Spring 2006</td>
<td>Alice Smith</td>
</tr>
<tr>
<td>4</td>
<td>Change the pre-req of INSY 3800 from ENGR 2100 to MATL 2100; replace MATL 2100 with ENGR 2100 as an ENGR elective</td>
<td>Spring 2006</td>
<td>Alice Smith</td>
</tr>
<tr>
<td>5</td>
<td>Replace COMP 1210 with COMP 3010</td>
<td>Fall 2008</td>
<td>LuAnn Sims</td>
</tr>
<tr>
<td>6</td>
<td>Increase semester hours for INSY 3021 from 2 hours to 3 hours</td>
<td>Spring 2009</td>
<td>LuAnn Sims</td>
</tr>
<tr>
<td>7</td>
<td>Make STAT 3610 a pre-req for INSY 3420 and INSY 3700</td>
<td>Spring 2009</td>
<td>LuAnn Sims</td>
</tr>
<tr>
<td>8</td>
<td>Change TECH elective list from “Any ISE course not required for the major” and COMP 6000, ELEC 3820, ELEC 6150, MATL 3100, MECH 3220, MECH 6510, STAT 6620, STAT 6630 to “Any INSY course not required for the major” and COMP 5000, ELEC 3820, ELEC 5150, MATL 3100, MECH 3220, MECH 5510, STAT 4610, STAT 4620, STAT 4630, STAT 5630, STAT 5670, STAT 5690</td>
<td>Spring 2009</td>
<td>LuAnn Sims</td>
</tr>
</tbody>
</table>
INDUSTRIAL AND SYSTEMS ENGINEERING (INSY)
2009-2010

FRESHMAN YEAR

- MATH 1610 Calculus I (P) ................................. 4
- CHEM 1030 Fundamentals of CHEM I (P) .......... 3
- CHEM 1031 Fundamentals of CHEM I Lab (P) .... 1
- ENGL 1100 English Composition I .................. 3
- ENGR 1100 Engineering Orientation (P) .......... 0
- ENGR 1110 Intro to Engineering (P) ................. 2
- History (core) .................................................. 3

- MATH 1620 Calculus II (P) ............................... 4
- PHYS 1600 Physics I (P) ................................. 4
- ENGL 1120 English Composition II ................ 3
- History (core) .................................................. 3
- COMP 1200 Intro to Comp Programming (MATLAB)(P) .. 2

SOPHOMORE YEAR

- MATH 2630 Calculus III ....................................... 4
- MATH 2650 Differential Equations ..................... 3
- PHYS 1610 Physics II ........................................... 4
- STAT 3600 Probability & Statistics I .................. 3
- ENGL 2200 World Lit I ........................................ 3
- MATH 2660 Linear Algebra ................................ 3
- STAT 3610 Probability & Statistics II ............... 3
- STAT 3611 Applied Statistics Lab ..................... 1
- INSY 3020 Occupational Safety & Ergonomics ...... 3
- INSY 3021 Methods Eng & Work Measurement Lab.. 3
- MATL 2100 Intro to Material Science ................ 3

JUNIOR YEAR

- INSY 3400 Stochastic Operations Research .......... 3
- INSY 3410 Deterministic Operations Research ...... 3
- INSY 3800 Manufacturing Processes .................. 3
- Social Science I ............................................... 3
- COMP 3010 Spreadsheet-Based Apps w/Visual Basic.. 3
- INSY 3420 Simulation ........................................ 3
- INSY 3600 Engineering Economics .................... 3
- INSY 3700 Operations Planning ....................... 3
- Social Science II ............................................... 3
- ENGL 2210 World Lit II ..................................... 3

SENIOR YEAR

- INSY 4330 Quality Control ............................... 3
- INSY 4500 Professional Practice ...................... 1
- INSY 4700 Manufacturing Systems .................. 3
- INSY Elective ................................................. 3
- ELEC 3810 Fundamentals of Electrical Engineering 3
- PHIL 1040 Business Ethics .............................. 3
- INSY 4800 Senior Design ................................. 3
- INSY Elective ................................................. 3
- ENGR Elective ............................................... 3
- Technical Elective ......................................... 3
- Fine Arts (core) ............................................. 3
- UNIV4AA0 EN1 Undergraduate Graduation .......... 0

TOTAL 126 SEMESTER HOURS

(P) - Denotes courses required for pre-engineering

Only academic advisors in Student Services may mark on this curriculum sheet. Other marks or alterations of this document could result in delayed graduation.

Approved on February 19, 2008
Department of Industrial & Systems Engineering
ENGR, INSY, and TECH Electives Revised 3-15-2010

**ENGR (pre Spring 2004) List of Approved Electives**
ENGR 2010 Thermo, ENGR 2050 Statics, ENGR 2070 Mech of Matl, ENGR 2200 Thermo, Fluids, Heat Transfer, ENGR 2350 Dynamics, ELEC 3820 Industrial Instrumentation, MATL 2100 Intro to Matl, MECH 2110 Statics and Dynamics

**ENGR List of Approved Electives effective Spring term, 2004**
ENGR 2050 Statics, ENGR 2200 Thermo, Fluids, Heat Transfer, MATL 2100 Intro to Materials Science, MECH 2110 Statics and Dynamics

**ENGR List of Approved Electives effective Spring term, 2006**
ENGR 2050 Statics
ENGR 2200 Thermo, Fluids, Heat Transfer
ENGR 2100 Mechanics
MECH 2110 Statics and Dynamics

**INSY Electives**
Any INSY course not required for major

**TECH (pre Spring 2004) List of Approved Electives**
All 3000 and above courses in the College of Engineering

**TECH List of Approved Electives effective Spring term, 2004**

**TECH List of Approved Electives effective Spring term, 2010**
Any INSY course not required for major
COMP 5000 Web Application Development (Senior Standing)
ELEC 3820 Industrial Instrumentation (Pre-req ELEC 3810)
ELEC 5150 Information Security (Senior Standing)
MATL 3100 Eng. Material-Metals (Pre-req MATL 2100)
MECH 3220 Computer Aided Eng. (Pre-req ENGR 1110, COMP 1200, co-req MATH 2650)
MECH 5510 Acoustics (Pre-req MATH 2650)
STAT 4610 Applied Regression Analysis (Pre-req STAT 3610 or STAT 3010)
STAT 4620 Applied Nonparametric Statistics (Pre-req STAT 3610 or STAT 3010)
STAT 4630 Applied Time-Series Analysis (Pre-req STAT 3610 or STAT 3010)
STAT 5630 Sample Survey, Design and Analysis (Pre-req STAT 3600)
STAT 5670 Probability and Stochastic Processes (Pre-req MATH 2630)
STAT 5690 Chaotic and Random Phenomena (Pre-req MATH 1620)

**NOTE:** Six (6) hours of ROTC required courses count as the ENGR elective and the TECH elective. Three (3) hours of BET required courses count as a TECH elective.
Appendix F. Academic Advising

Hello INSY majors and PIE pre-majors:

Please read this entire email for instructions.

I look forward to meeting with each of you to help you plan your Fall 2010 (and Summer 2010 if applicable) schedules. My office is located in Shelby 3301C, third floor, west-most part of the building on the side facing Magnolia Street.

Note to co-op students or students residing elsewhere this semester: I will advise you by email, by phone, or in person. Please email me your proposed list of courses for Summer 10/Fall 10 as soon as possible. If you want to talk to me by phone, please give me a phone number and a good time to call you.

You will have a specific time ticket (date and time that represent the earliest you can register based on hours earned through Fall 2009 + current hours for Spring 2010) assigned to you by the system. You should be able to see your time ticket by logging into AU Access and selecting the TIGERi tab. The earliest time ticket is March 4, Seniors begin March 10, Juniors March 25, Sophomores April 2, and Freshmen April 2 (These dates are approximate; your time will vary by your hours). There is a copy of the time ticket schedule in the appointment book. You can also go to this link to see all the time tickets:

http://www.auburn.edu/administration/registrar/calendars/timeticket.pdf

You may make advising appointments for these days:

Priority I: Beginning Feb. 25
Seniors (90+ hours) and Priority II: Beginning Mar. 4
Juniors (60+ hours): Beginning Mar. 11
Sophomores (30+ hours): Beginning Mar. 25
Freshmen: Beginning Mar. 31

There are sign-up sheets in a notebook in the department lobby (Shelby 3301) for you to sign up for 20 minute appointments. If you believe you need more than 20 minutes, please sign up for 2 appointment times. I am only advising by appointment during this advising period. As an alternative, you are welcome to receive advising from Dr. Alice Smith, Shelby 3301B.

Make sure you sign up on the right sheet for your priority/class. Please don't sign up on an earlier sheet than for your class. Class designations and hours are written on the top of the sheets. Also, please don't email or call me to schedule an appointment (unless you are a co-op or not enrolled for this semester); come by Shelby in person to sign up for an appointment in the book.
I want to take your photograph (if I don’t already have it) to place with your file. Please come prepared.

Please print the form "Course Scheduling Form" whose link is located at the bottom of this page:

http://www.eng.auburn.edu/programs/insy/programs/ugrad/advising.html

and fill it out for Spring 10 before coming to your appointment.

Here is a link to the schedule for our department's classes for Spring 10.

http://eng.auburn.edu/programs/insy/programs/courses/index.html

NOTE TO GRADUATING SENIORS: If you intend to graduate, you must register for the course UNIV 4AA0-EN1 for the semester in which you intend to graduate. Here is the link to AU’s graduation website:

http://www.auburn.edu/administration/registrar/helpful-resources/graduation

You also need to have a “graduation check” done by Engineering Student Services in Shelby 1210.

LuAnn Sims
Academic Advisor & Instructor
Department of Industrial and Systems Engineering
Auburn University
Phone: 334-844-1430
Fax: 334-844-1381
I request the following substitution for required course work. I understand that this substitution must be in accordance with College of Engineering and University Policy.

Name of Student: __________________________ Class & Curriculum: ___________

Banner ID: ________________________________

<table>
<thead>
<tr>
<th>SUBSTITUTE</th>
<th>FOR REQUIRED WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>Title</td>
</tr>
<tr>
<td>Course Number</td>
<td>Title</td>
</tr>
</tbody>
</table>

Recommended by (Faculty) _________________________________ Date: __________

Department Head Approval: _________________________________ Date: __________

Dean’s Approval: _________________________________ Date: __________

RETURN TO SECRETARY IN ENGINEERING STUDENT SERVICES, SHELBY 1210.

Revised 5/5/10