Assessment Findings and Curricular Improvements
School of Engineering
Master's and Doctoral Programs in
Biomedical Engineering
Civil Engineering
Electrical Engineering and Computer Science
Mechanical Engineering

Each of engineering's graduate programs (i.e. biomedical, civil, engineering management, electrical and computer science, and mechanical) conducts reviews of its programs per the processes described in Sections I and II. This section summarizes the findings by each program.

A Master's and Doctoral Programs in Biomedical Engineering

A.1 Assessment Measures

The Department of Biomedical Engineering within the School of Engineering uses the following measures to assess student learning outcomes:

- Review of coursework by major professors, including: exams, homework assignments, course projects (as appropriate), and reports (as appropriate)
- Review of course content by department chairs, including topics covered and tools/techniques taught
- Student course evaluations
- Comprehensive Exam (for doctoral students)
- Evaluation of theses (if applicable) by major professors and readers using criteria: originality of work, quality of experimental design, accuracy of data analysis, quality of written report, and oral presentation.

A.2 Assessment Findings

A 2.1 Course Discussion

The Department of Biomedical Engineering in the School of Engineering analyzed course grade, evaluation, and enrollment data in graduate level courses considered to be core to the master's degree for a five-year period (Fall 2008 through Spring 2013). Table 1 below summarizes the statistical findings (i.e. average $\pm$ std err) of the courses.

Table 1: Summary of 5-year course evaluation data for key courses in biomedical engineering.

	ENGR 516	ENGR 520	BE 513	BE 528	BE 544	BE 581
Teacher (10=high; 1=low)	**7.67±1.01**	**7.84±1.20**	**8.04±0.90**	**9.20±0.10**	**9.91±0.09**	**9.16±0.28**
Course (10=high; 1=low)	**7.58±0.93**	**7.47±1.10**	**8.12±0.93**	**8.84±0.29**	**9.82±0.14**	**9.17±0.21**
Course Grade (4.0 Scale)	**3.64±0.29**	**3.56±0.33**	**3.59±0.27**	**3.48±0.09**	**3.68±0.12**	**3.88±0.04**
Enrollment (high/low)	**19.27±9.63 (32/4)**	**16.75±10.43 (30/3)**	**17.40±5.27 (26/12)**	**13.00±4.30 (17/6)**	**10.80±4.44 (18/7)**	**11.00±4.16 (16/6)**

ENGR 516 and ENGR 520 are graduate level mathematics courses that are required for all biomedical engineering graduate students. For these courses, enrollment has varied considerably annually. Enrollment in ENGR 516 varied from a low of 4 in Summer 2011 to a high of 32 in Spring 2010 with a healthy average of 19.27. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.67 (teacher) and 7.58 (course) over the five-year period. Average GPA for students taking ENGR 516 varied from a low of 3.18 in Fall 2010 to a high of 3.93 in Summer 2011 with an average of 3.64 ± 0.29. Enrollment in ENGR 520 varied from a low of 3 in Summer 2011 to a high of 30 in Spring 2013 with a healthy average of 16.75. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.84 (teacher) and 7.47 (course) over the five-year period. Average GPA for students taking ENGR 520 varied from a low of 3.04 in Fall 2008 to a high of 4.0 in Summer 2011 with an average of 3.56 ± 0.33.

Within the Department of Biomedical Engineering, there are four (4) courses that are considered core for the program. These are Biomedical Instrumentation (BE 513), Rehabilitation Engineering (BE 528), Telemedicine & E-Health (BE 544), and Medical Imaging (BE 581). The teacher and course evaluation data for these four courses has remained acceptable over the five-year period. The average teacher evaluation scores for BE 513 varied from a high of 9.25 in Spring 2010 to a low of 7.07 in Spring 2013 with an average of 8.04. The course evaluation scores varied similarly from a high of 9.13 in Spring 2010 to a low of 6.94 in Spring 2011 with an average of 8.12. The average GPA for this course also varied considerably from a low of 3.26 in Spring 2011 to a high of 4.0 in Spring 2009 with an average of 3.59 ± 0.27. The average teacher evaluation scores for BE 528 varied from a high of 9.36 in Fall 2009 to a low of 9.07 in Fall 2008 with an average of 9.20. The course evaluation scores varied similarly from a high of 9.27 in Fall 2009 to a low of 8.67 in Spring 2011 with an average of 8.84. The average GPA for this course also varied considerably from a low of 3.34 in Fall 2009 to a high of 3.55 in Spring 2011 with an average of 3.48 ± 0.09. The average teacher evaluation scores for BE 544 always remained high, with highs of 10 in Spring 2009 and Spring 2013 and a low of only 9.78 in Spring 2011 with a high average of 9.91. The course evaluation scores also remained extremely high throughout this five-year period ranging from a high of 10 in Spring 2009 to a low of only 9.67 in Spring 2011 with a high average of 9.82. The average GPA for this course varied considerably while always remaining significant from a low of 3.59 in Spring 2012 to a high of 3.89 in Spring 2009 with an average of 3.68 ± 0.12. The average teacher evaluation scores for BE 581 varied from a high of 9.45 in Fall 2009 to a low of 8.89 in Fall 2011 with an average of 9.16. The course evaluation scores always remained above 9, ranging from a high of 9.4 in Fall 2009 to a low of 9 in Fall 2010 with an average of 9.17. The average GPA for this course remained significantly high throughout the five-year period varying from a low of 3.87 in Fall 2011 to a high of 3.92 in Fall 2009 with an average of 3.88 ± 0.04.

At the end of each semester, the department chairperson in conjunction with instructors reviews the content of each course and obtains feedback from instructors regarding any issues that may have risen

during the semester, including technology needs, student feedback, etc. Corrective actions are identified and implemented, as needed.

A.2.2 Masters & Doctoral Progression Data

Enrollment in the masters and doctoral programs in the Department of Biomedical Engineering (BE) continues to grow, increasing by 40.9% from Fall 2007 to Fall 2013, namely from 22 in Fall 2007 to 31 for Fall 2013. The growth is primarily a result of increases at the doctoral level. Figure 1 below shows total graduate enrollment in the BE department over the past 7 years.

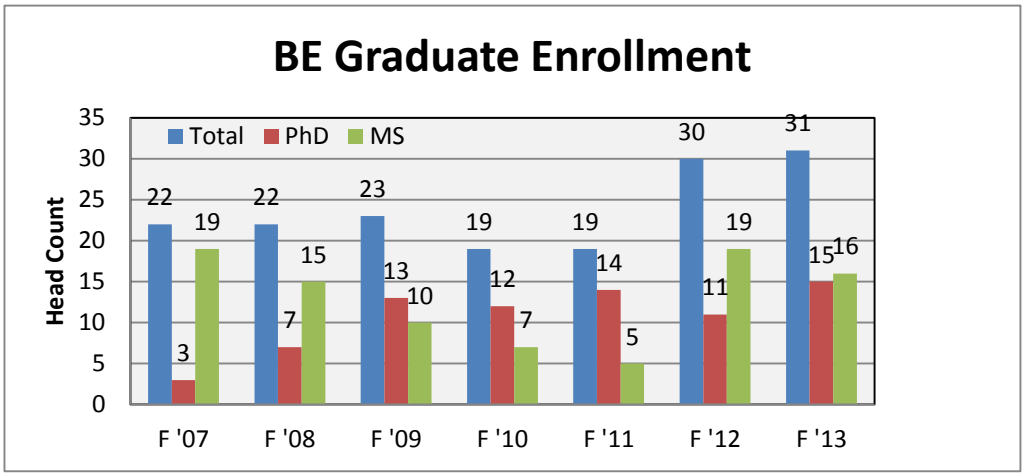


Figure 1: Biomedical engineering graduate enrollment.

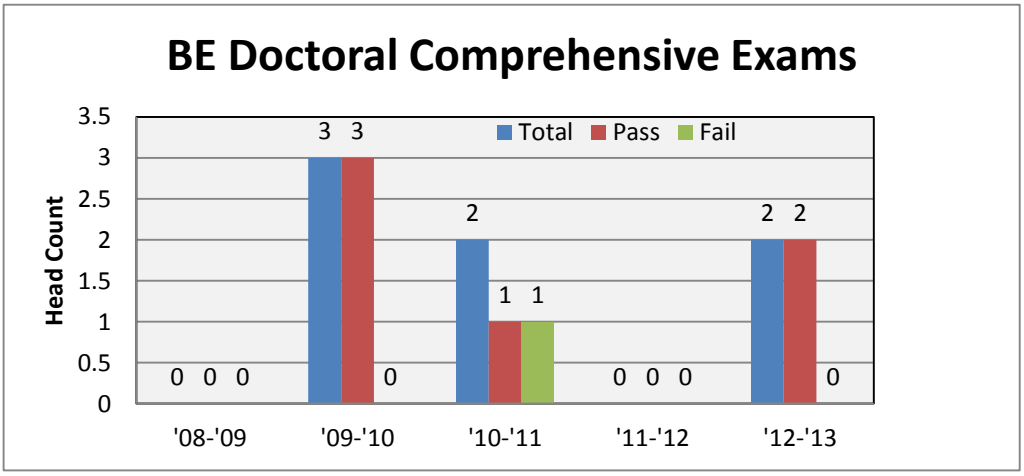


Figure 2: Biomedical engineering doctoral comprehensive exams.

The department has several different types of master's students. Full-time coursework students, especially those entering from CUA's accelerated bachelors-master's program, usually complete the master's degree requirements in one year. Full-time master's students completing a research thesis usually complete the degree in two years. From 2008-2012, 30 students were admitted in the master's program cohorts. Twenty of these students have completed their master's degrees. Progression towards the master's degree is as expected by the program, with 47% graduating within 1 year of admission, and 68% graduating within 2 years (as of Fall 2013).

For the same period (2008-12), 15 students were admitted into the doctoral program in biomedical engineering. Three students have completed their degrees and 7 remain enrolled in the program as of

Fall 2013. Over this same period, 7 students have taken the comprehensive exam and 6 students have passed (Figure 2). The mean time to graduation for the 3 graduates was 3.67 years. Therefore, the time-to-degree for these students was as expected by the department.

A.2.3 Curricular Improvements

In 2001, the School of Engineering's graduate curriculum committee adopted a standard core curriculum consisting of four graduate level courses from which graduate students must select a minimum of two. For biomedical engineering, the appropriate courses are two graduate level math courses (ENGR 516 and ENGR 520) that the department believed to be essential. This curriculum improvement has strengthened the technical training of our graduate students.

In addition, the BE department has adopted common courses within two core specialization tracks, biomedical instrumentation and rehabilitation engineering. Within the biomedical instrumentation focus area, common courses include biomedical instrumentation (BE 513) and medical imaging (BE 581). In the area of rehabilitation engineering, common courses include rehabilitation engineering (BE 528) and telemedicine and e-health (BE 544). These four common courses are offered annually based upon their enrollment and high demand.

Based upon course review sessions between instructor and chair, instructor feedback, student evaluations, and other input, the department has also made additional curricular improvements implemented over the last 5 years:

- introduction of 13 new graduate courses over the past 5 years:
    - BE597 Biomedical Research Methods
    - BE550 Nano-medicine
    - BE586 Ultrasound Imaging and Therapeutics
    - BE521 Neural Control of Movement
    - BE508 Biomedical Applications of Origami
    - BE533 Human Factors Engineering and Ergonomics
    - BE582 Medical Image Processing
    - MSE571 Engineering Artificial Organs
    - BE532 Sensory Motor Integration
    - BE 524 Prosthetics & Orthotics
    - BE 613 Advanced Topics in Medical Instrumentation
    - BE 681 Advanced Topics in Optical Imaging
    - BE 797 Special Topics in Biomedical Engineering
- adding more hands-on projects for students in biomedical instrumentation (BE 513)
- addition of a lab component for ENGR 503 Controls
- adding more clinical input to BE 581 (Medical Imaging). Several lectures are provided by physicians.
- a larger laboratory component added to Advanced Biomechanics (BE 502)
- introduction of upper level graduate courses (BE613, BE681, BE797)

B Master's and Doctoral Programs in Civil Engineering

B.1 Assessment Measures

The Department of Civil Engineering within the School of Engineering uses the following measures to assess student learning outcomes:

- Review of coursework by major professors, including: exams, homework assignments, course projects (as appropriate), and reports (as appropriate)
- Review of course content by department chairs, including topics covered and tools/techniques taught
- Student course evaluations
- Comprehensive Exam (for doctoral students)
- Evaluation of theses (if applicable) by major professors and readers using criteria: originality of work, quality of experimental design, accuracy of data analysis, quality of written report, and oral presentation.

B.2 Assessment Findings

B.2.1 Course Discussion

The Department of Civil Engineering supports a Master's degree program and a Ph.D. program. The Master's program includes a core of courses in mathematics, numerical methods, systems analysis, and economics as well as courses in a particular field of study, such as structural engineering, geotechnical engineering, transportation engineering, and construction engineering and management. The Ph.D. program includes fields of study similar to those of the Master's program.

Table 2 below lists the teacher and course evaluations and enrollment data in graduate level courses considered to be core for the Master's degree for a five-year period (Fall 2008 through Spring 2013). The table summarizes the statistical findings (i.e. average ± standard deviation) of the courses.

Table 2: Summary of 5-year course evaluation data for key courses in civil engineering's Master'sE program.

	ENGR 516	ENGR 520	CMGT 547	CE 521	CE 575	CE 587
Teacher (10=high; 1=low)	**7.67±1.01**	**7.84±1.20**	**9.29±0.53**	**8.88±0.00**	**8.79±1.72**	**9.15±0.21**
Course (10=high; 1=low)	**7.58±0.93**	**7.47±1.10**	**9.13±0.50**	**8.63±0.00**	**7.86±1.01**	**9.12±0.35**
Course Grade (4.0 Scale)	**3.64±0.29**	**3.56±0.33**	**3.88±0.15**	**3.45±0.00**	**3.47±0.47**	**3.46±0.22**
Enrollment (high/low)	**19.27±9.63 (32/4)**	**16.75±10.43 (30/3)**	**22.67±8.36 (28/6)**	**11.00±0.00 (11/11)**	**6.25±2.99 (9/2)**	**12.60±4.22 (19/8)**

In the Civil Engineering program all Master's and doctoral students are required to take at least two of four core courses (ENGR 516, ENGR 520, CE 575, and CMGT 574. ENGR 516 and ENGR 520 are graduate level mathematics courses.) For these courses, enrollment has varied considerably annually.

Enrollment in ENGR 516 varied from a low of 4 in Summer 2011 to a high of 32 in Spring 2010 with a healthy average of 19.27. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.67 (teacher) and 7.58 (course) over the five-year period. Average GPA for students taking ENGR 516 varied from a low of 3.18 in Fall 2010 to a high of 3.93 in Summer 2011 with an average of 3.64 ± 0.29. Enrollment in ENGR 520 varied from a low of 3 in Summer 2011 to a high of 30 in Spring 2013 with a healthy average of 16.75. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.84 (teacher) and 7.47 (course) over the five-year period. Average GPA for students taking ENGR 520 varied from a low of 3.04 in Fall 2008 to a high of 4.0 in Summer 2011 with an average of 3.56 ± 0.33.

The other two recommended core courses include Managerial Engineering Economics (CMGT 547), and Systems Analysis (CE 575). The numerical scores for CMGT 547 have been adjusted to fit the scales given in the left hand column. In each of these courses the ratings are above the 70% level expected by the School.

Average grades given in these four courses are represented by their maximum and minimum grade point averages (GPA) and standard deviations for the five year period from Fall 2008 to Spring 2013, as shown in Table 2. Course summary data for all courses listed in Table 2 are provided in Appendix A.

While the GPAs reflect the individual student's performance, they do to some degree also reflect the instructors' level of grading. Nevertheless all GPAs are above 3.0, which is the expected minimum outcome for graduate students.

At the end of each semester, the program director in conjunction with instructors review the content of each course and the feedback from instructors regarding any issues that may have arisen during the semester, including technology needs, student feedback, etc., corrective actions are identified and implemented, as needed.

B.2.2 Masters & Doctoral Progression Data

Enrollment in the part-time masters program in the Department of Civil Engineering (CE) was at its highest level in 2010-11. Since then the program has remained relatively steady with an average of 10 students enrolling each year. The department has several different types of master's students. Full-time coursework students, especially those entering from CUA's accelerated Bachelor's-Master's program, usually complete the Master's degree requirements in one year. Full-time Master's students completing a research thesis usually complete the degree in three semesters or two years. Figure 3 shows the total enrollment in the graduate programs over the period from Fall 2007 through Fall 2013.

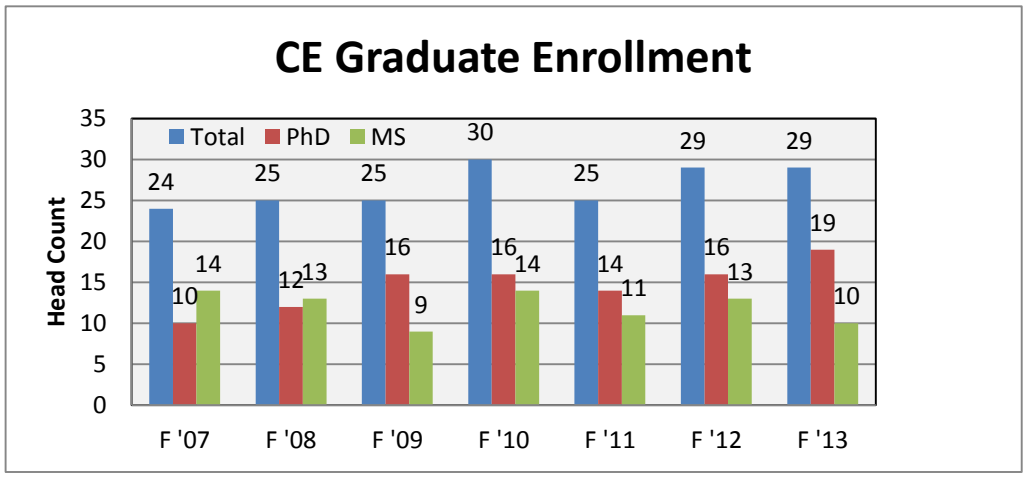


Figure 3: Civil engineering graduate enrollment.

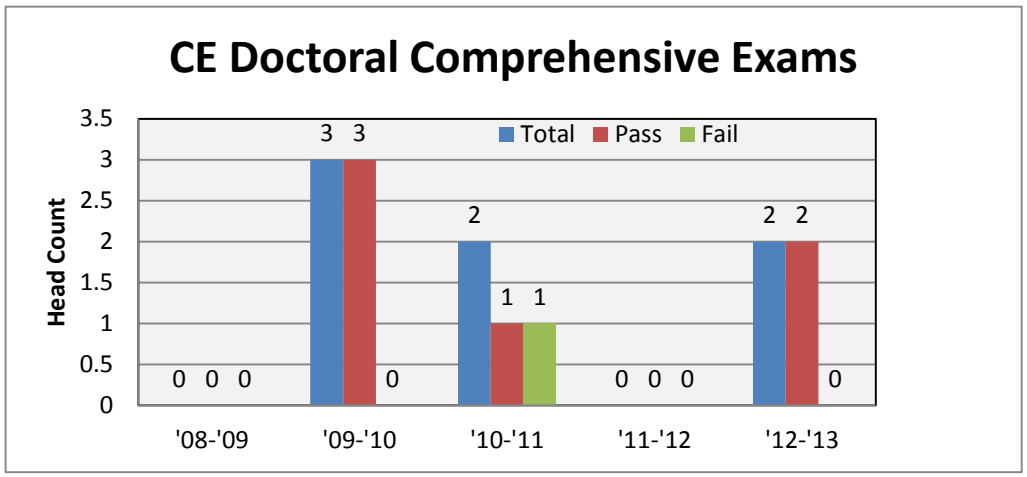


Figure 4: Civil engineering doctoral comprehensive exams.

The Ph.D. program has seen a steady but gradual growth since 2007. Ph.D. enrollment from before 2008 is reflected in the chart in Figure 3. The chart shows the total graduate enrollment in the CE department over the past 5 years. Of the 17 Ph.D. students who have entered since 2008, 10 Ph.D. students are currently actively studying for their degrees. Of the 17 students, 7 have passed the Comprehensive exam and have either graduated or are continuing their dissertation research, one has failed the comprehensive exam and obtained a Master's degree, one has graduated with a Master's degree and, and 6 students are pursuing coursework and preparing for the Comprehensive Exam.

The Ph.D. students are distributed somewhat evenly among the current faculty in the Department of Civil Engineering with the exception of new faculty who advise a smaller number of PhD students. Thus, civil engineering faculty members who have been at CUA for more than 3 years have on average about 4 Ph.D. students working with them on various projects in structural engineering, geotechnical engineering, transportation engineering and construction engineering and management. Additional Ph.D. students are expected in the future when the newest faculty member in structural engineering has become more established as a scholar and researcher.

B.2.3 Curricular Improvements

In 2001, the School of Engineering's graduate curriculum committee adopted a standard core curriculum consisting of four graduate level courses. All four courses are recommended for graduate students in the civil engineering program. Two of them are graduate level math courses (ENGR 516 and ENGR 520) and are required, while the other two (CE 575 and CMGT 547) are recommended, but may be replaced by other courses if they are considered more important and appropriate for the particular student's Ph.D. research. This curriculum improvement has strengthened the technical training of the department's graduate students.

Graduate courses in the areas of Structural Engineering, Geotechnical Engineering, Transportation Engineering, Environmental Engineering and Water Resources and Construction Engineering and Management, and Systems Engineering are often offered by fulltime faculty members in the respective areas. In order to meet and improve the number of course offerings and to provide a variety of courses available to graduate students, most of these are offered on two year rotations The graduate level courses currently offered regularly in each discipline of Civil Engineering include:

- CE 504: Stress-Strain Behavior in Soils
- CE 525: Nondestructive Evaluation and Condition Assessment of Structures
- CE 562: Seepage and Slope Stability
- CE 563: Applied Hydrology
- CE 564: Surface Water Quality
- CE 565: Water Resources Engineering
- CE 570: Innovative Infrastructure Management
- CE 575: Introduction to Systems Analysis
- CE 582: Value Engineering
- CE 587: Estimation and Bidding
- CE 588: Construction Operation and Management
- CE 589: Construction Scheduling Techniques
- CE 590: Construction Operational Analysis
- CE 591: Engineering Hydrogeology and Groundwater Flow
- CE 594: Construction Law, Operations and Project Delivery
- CE 596: Water and Wastewater Treatment Engineering
- CE 599: Transportation Safety Engineering

All the above-mentioned graduate courses have been introduced in the past three years.

In addition, the following need-based and special topic courses have been offered non-regularly:

CE 604: Constitutive Modeling and Frictional Materials
CE 586: Advanced Cementitious Material
CE 767: Special Topics on Deterministic and Stochastic Inverse Modeling

Some of the specific course improvements include:

- CE 596 has been made a project based
- The instructor for CE 589 has been changed and the course materials have been updated to include several new topics, materials and assignments.

- Replacement of the textbook for CE 575 based on student feedback in the Spring of 2005

Any questions concerning CE can be directed to the Chair, Dr. Lu Sun (202) 319-6677.

C Master's Degree Program in Engineering Management

C.1 Assessment Measures

The Engineering Management Program (EMP) within the School of Engineering employs a series of direct and indirect measures to assess the effectiveness of the classroom instruction, lectures, case studies, projects, and text books:

Direct Measures

- Review of student projects, exams or theses by several faculty members and/or external evaluators applying the same specified criteria;
- Oral Presentations and Projects;
- Portfolios of student work (evaluated with rubrics) for use like case studies, and
- Pre- and post-exams.

Indirect Measures

- Student evaluations;
- Focus groups;
- Student surveys on the quality of the class, instructor, text book and Program; and
- Program reviews.

C.2 Assessment Findings

C.2.1 Course Discussion

The Engineering Management Program in the School of Engineering analyzed course grade, evaluation, and enrollment data in graduate level courses considered to be core to the Master's degree for a five-year period (Fall 2008 through Spring 2013). Table 4 below summarizes the statistical findings (i.e. average ± std err) of the courses.

Table 4: Summary of 5-year course evaluation data for key courses in the Engineering Management Program.

	CMGT 505	CMGT 510	CMGT 547	CMGT 572	CMGT 573	CMGT 574
Teacher (10=high; 1=low)	**9.34±0.53**	**9.07±0.68**	**9.29±0.53**	**8.41±0.75**	**9.12±0.51**	**9.42±0.54**
Course (10=high; 1=low)	**9.05±0.46**	**8.76±0.80**	**9.13±0.50**	**8.53±0.63**	**8.71±0.79**	**9.45±0.40**
Course Grade (4.0 Scale)	**3.85±0.16**	**3.54±0.17**	**3.88±0.15**	**3.56±0.05**	**3.69±0.18**	**3.84±0.09**
Enrollment (high/low)	**26.80± 6.76 (34/18)**	**13.00±2.24 (17/10)**	**22.67±8.36 (28/6)**	**13.80±5.07 (19/6)**	**18.86±8.59 (26/3)**	**20.17±8.77 (30/4)**

The EMP Director uses a 3.0 rating (Good) or better as a benchmark for all rating criteria. As it can be seen from Table 4, the Teacher ratings range from a low of 8.41 out of 10.0 to a high of 9.42. The course ratings range from a low of 8.53 out of 10.0 to a high of 9.45. Consequently, all ratings are above the acceptable benchmark range.

Within the Engineering Management Department there are 13 coursers offered; 6 of which are courses considered as core for the program. These core courses include CMGT 505 – Decision Analysis, CMGT 510 – Information Systems for Managers, CMGT 547 – Engineering Economics, CMGT 572 – Organizational Theory and Behavior, CMGT 573 – Planning and Control of Organizations, and CMGT 574 – Strategic Management. Course summary data for all courses listed in Table 4 are supplied in Appendix A.

In addition to soliciting feedback on the Teacher, Course and Teaching Objectives, the EMP Director solicits input on the curriculum from the Instructors as well as Executives in Government and Industry. It is critical to the success of the EMP, that its curriculum provides students with the tools needed to further their professional careers. Students who graduate with a Master's of Science in Engineering from the CUA EMP will possess the knowledge and requisite skills to:

1. Demonstrate specific factual knowledge with respect to technical management involving mathematical techniques including probability and statistics, discounted cash flow, resource optimization (minimization and maximization), multi-attribute utility theory and Bayesian analysis;
2. Demonstrate factual knowledge of the management science involving organizations (both for profit and non-profit), project controls, standards, engineering risk management, earned value analysis, program planning and budgeting, systems integration, and information systems management;
3. Have acquired basic proficiency in the techniques of management analysis, evaluation, and review based on case studies, projects, research assignments, and papers / presentations. This proficiency includes development of (a) working familiarity with more specialized forms of analysis, and (b) proficiency in recognizing and using appropriate sources, such as codes and standards, on-line sources of information, and even direct data acquisition through interviewing techniques, and accessing public and private databases;
4. Perform technical and scientific research (empirical, quantitative, comparative or a combination of methods) on engineering and related management topics;
5. Be proficient in writing and rhetoric and in argumentation and presentation in both written and oral forms and demonstrate the capacity to present research in scholarly papers, various new forms of media and effective oral presentations; and
6. Have acquired the capacity to assess critically various technical management approached and engineering assumptions / solutions.

C.2.2 Progression Data

Enrollment in the Engineering Management Program continues to grow, rising from 20 in Fall 2007 to the 31 for Fall 2013, with a high of 57 in Fall 2011. Figure 5 below shows total graduate enrollment in the EMP over the past 7 years. The progression of students has been fairly steady of the same time period as can be seen from the data found in Appendix A.

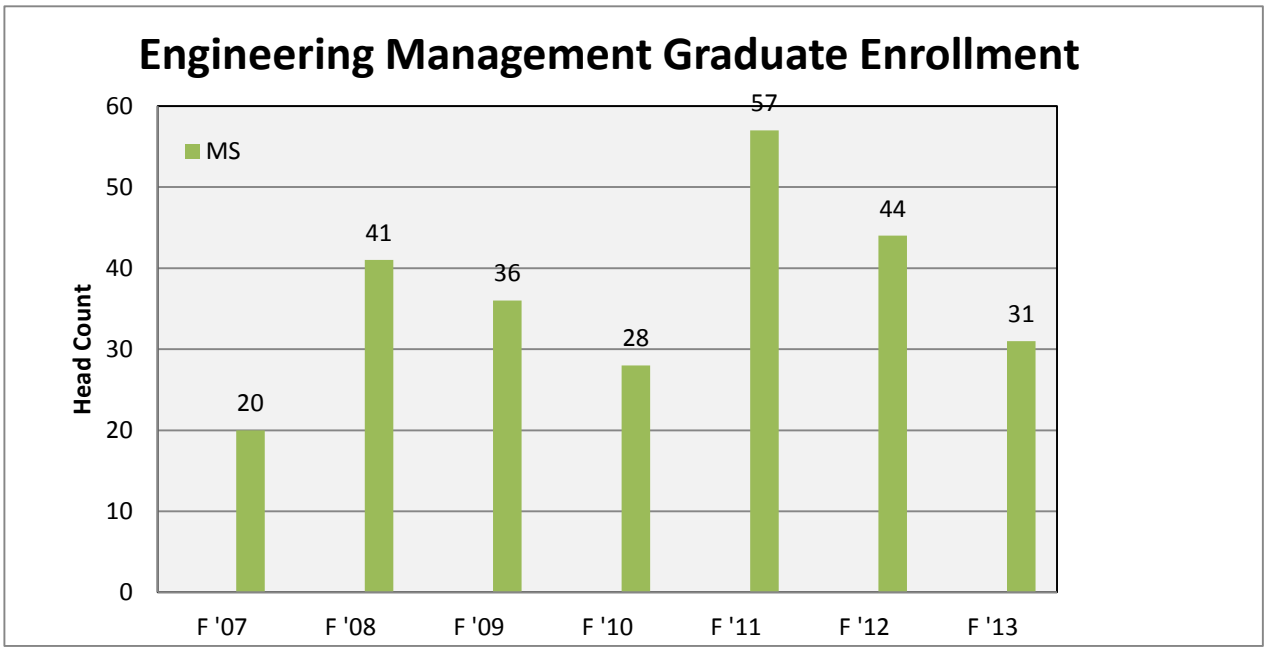


Figure 5: Engineering Management Program graduate enrollment.

One of the reasons for the increase in EMP enrollment has been the development of specific tracks which enable a student to concentrate study in areas of interest or of specific benefit to their professional careers. The overall Master of Science in Engineering curriculum enhances management performance and develops managerial skills. It is designed to provide the student with knowledge of the theory and practice of management as it specifically pertains to engineering and technology-oriented organizations and activities. The program is oriented to the management of engineering processes within the broader context of a company or agency enterprise. Three tracks are offered to allow the student to focus on their career preference:

Engineering Management and Organization -- Developed to provide a graduate-level foundation for the practice of managing engineering organizations. It is appropriate for those that will assume leadership positions in technically oriented organizations.

Project and Systems Engineering Management -- Developed to provide a graduate level foundation for the practice of managing projects associated with development and life cycle management of a product. It is appropriate for project managers and system engineers in management roles or those that will be in those positions.

Technology Management – Developed to provide a graduate-level foundation for the practice of managing technology development, implementation or sustainment activities. It is appropriate for those that will assume leadership positions in technology development or sustainment organizations.

Each track has core courses that give the foundation for engineering management and electives that allow students to focus their degree to their personal career plan. The additional course work is used to tailor the degree program to the student's specific needs.

The Master of Science in Engineering (Engineering Management) degree program requires completion of 30 semester credit hours. The School of Engineering offers a wide range of specialties relating to

mechanical engineering, civil engineering, electrical engineering, computer science and biomedical engineering. Elective courses up to six credits may be transferred from accredited educational institutions into the program. Our partnership with Defense Acquisition University (DAU) allows up to nine credits of their ACE accredited graduate-level courses to be transferred into the program. Our partnership with the Nuclear Power Directorate allows transfer of 12 credits for completion of the U.S Navy Officer Nuclear Power School Program.

The engineering management Master's degree program results in an engineering/scientific degree, rather than a business degree; therefore, the program candidate should have an engineering, physical science or mathematics degree with appropriate technical or engineering experience. (Depending on experience, candidates without mathematics-based degree may be accepted for the program. Prerequisites may be required.) A minimum of 30 semester credit hours is required, but a thesis is not required. All M.S.E. candidates for graduation must have earned at least a 3.0 cumulative grade point average in courses leading to the degree.

C.2.3 Curricular Improvements

The Director of the EMP constantly evaluates the curricula, the text books, the instructors and other competitive programs to determine what if any changes / modifications should be made to the EMP. The Director also reads and catalogs every evaluation form from every student that gets submitted. Using this data, the Director does a collective significance review and determines what if any changes need to be made for the next academic year. The results of these assessments to improve teaching and learning and inform planning and resource allocation decisions.

Based upon course review sessions between instructor and chair, instructor feedback, student evaluations, and other input, the EMP has also made additional curricular improvements implemented over the past several years throughout its 14 courses which include:

CMGT 505: Decision Analysis|
CMGT 508: Technology Management
CMGT 510: Information Systems for Managers
CMGT 515: Software Engineering for Managers
CMGT 547: Managerial Engineering Economics
CMGT 561: Engineering Ergonomics
CMGT 562: Engineering Risk Management
CMGT 564: Strategic Standardization
CMGT 570: Project Management
CMGT 572: Organizational Theory and Behavior
CMGT 573: Planning and Control of Organizations
CMGT 574: Strategic Management
CMGT 575: Introduction to Systems Analysis
CMGT 580: Introduction to Systems Engineering Management

Some of the specific course improvements include:

- addition of exam review sessions for CMGT 510 based upon student feedback during Fall 2013
- replacement of instructor for CMGT 570 in Spring 2010 based upon student feedback on teacher effectiveness and level of interaction

- replacement of the textbook for CMGT 573 based on instructor feedback in the Spring of 2011
- update of adjunct professor CVs based on the State Council of Higher Education for Virginia (SCHEV) in Summer 2012

Any questions concerning the EMP can be directed to the Director, Mr. Jeffrey Giangiuli (202) 319-5191.

D Master's and Doctoral Programs in Electrical Engineering and Computer Science

D.1 Assessment Measures

The Department of Electrical Engineering and Computer Science within the School of Engineering uses the following measures to assess student learning outcomes:

- Review of coursework by full-time professors, including exams, homework assignments, course projects (as appropriate), and reports (as appropriate);
- Review of course content by department chairs and oversight committees, including topics covered and tools/techniques taught;
- Student course evaluations;
- Comprehensive Exam (for doctoral students);
- Evaluation of theses (where applicable) by major professors and readers using criteria that include originality of work, quality of experimental design, accuracy of data analysis, quality of written report, and clarity in oral presentation.

D.2 Assessment Findings

D.2.1 Course Discussion

The Department of Electrical Engineering and Computer Science in the School of Engineering has analyzed course grades, evaluations, and enrollment data in graduate level courses considered to be core to the master's degree for a five-year period (Fall 2008 through Spring 2013). Table 5 below summarizes the statistical findings (i.e., mean $\pm$ standard deviation) of core courses.

Table 5: Summary of 5-year course evaluation data for key courses in electrical engineering.

	ENGR 516	ENGR 520	EE 561	CSC 526	CSC 531	CSC 565
Teacher (10=high; 1=low)	**7.67±1.01**	**7.84±1.20**	**8.23±1.90**	**9.17±0.00**	**9.45±0.08**	**10.00±0.00**
Course (10=high; 1=low)	**7.58±0.93**	**7.47±1.10**	**7.99±1.43**	**9.00±0.00**	**9.28±0.09**	**9.50±0.00**
Course Grade (4.0 Scale)	**3.64±0.29**	**3.56±0.33**	**3.29±0.42**	**3.35±0.19**	**3.66±0.21**	**3.93±0.05**
Enrollment (high/low)	**19.27±9.63 (32/4)**	**16.75±10.43 (30/3)**	**16.60±3.91 (23/13)**	**10.00±3.61 (13/6)**	**8.75±5.56 (15/2)**	**7.50±0.71 (8/7)**

ENGR 516 and ENGR 520 are graduate level mathematics courses that are required for all biomedical engineering graduate students. For these courses, enrollment has varied considerably annually. Enrollment in ENGR 516 varied from a low of 4 in Summer 2011 to a high of 32 in Spring 2010 with a healthy average of 19.27. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.67 (teacher) and 7.58 (course) over the five-year period. Average GPA for students taking ENGR 516 varied from a low of 3.18 in Fall 2010 to a high of 3.93 in Summer 2011 with an average of 3.64 ± 0.29. Enrollment in ENGR 520 varied from a low of 3 in Summer 2011 to a high of 30 in Spring 2013 with a healthy average of 16.75. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.84 (teacher) and 7.47 (course) over the five-

year period. Average GPA for students taking ENGR 520 varied from a low of 3.04 in Fall 2008 to a high of 4.0 in Summer 2011 with an average of 3.56 ± 0.33.

Other courses widely followed in electrical engineering include Communication and Computer Network Simulation (EE 534), Computer Security and Privacy (EE 569), Introduction to Antenna Systems (EE 540), EE 576 (Robotics), and Random Signal Theory (EE 561). Given the breadth of focus areas that are offered in Electrical Engineering, not all students will be required to take all five of these courses. For example, students pursuing electromagnetics (say) will certainly take and Introduction to Antenna Systems (EE 540), whereas students pursuing communications systems (say) will take EE 534and so on. The five courses selected in Table 5 are thus representative of those followed by most of our graduate students. In each of these courses, teacher rating and course rating are above the expected minimum levels of 70% for the School. Course summary data for all courses listed in Table 5 are supplied in Appendix A.

At the end of each semester, the department chairperson, in conjunction with instructors, reviews the content of each course and obtains feedback from instructors regarding any issues that may have arisen during the semester, based on student feedback, technological advances, evolving pedagogical needs, and so forth; corrective actions are identified and implemented, as needed.

D.2.2 Masters & Doctoral Progression Data

Enrollment in the Masters and doctoral programs in the Department of Electrical Engineering and Computer Science (EECS) has been increasing since 2007, with the highest increase in 2009. Figure 4 below shows total graduate enrollment in the EECS department over the past 7 years.

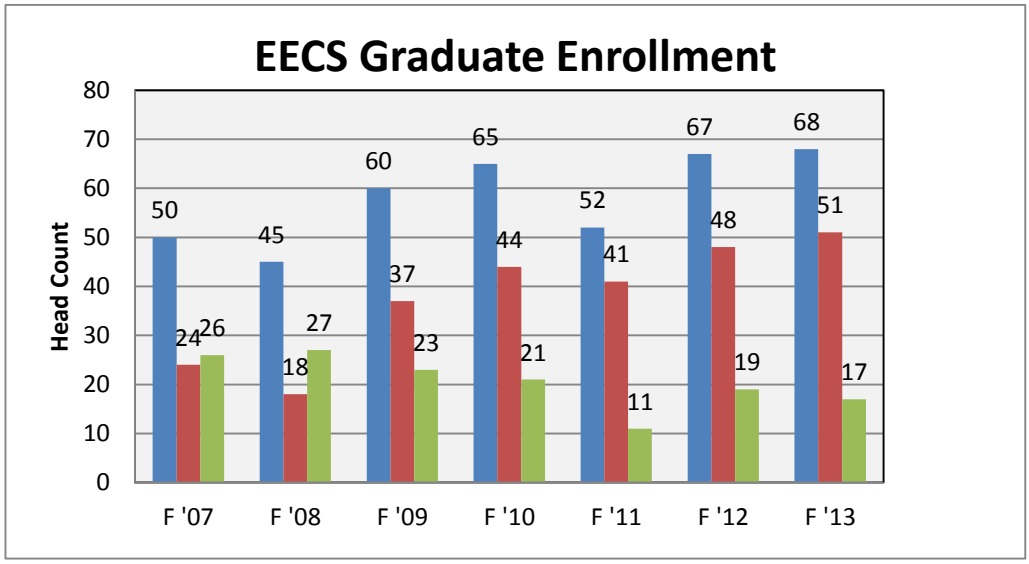


Figure 6: EECS graduate enrollment.

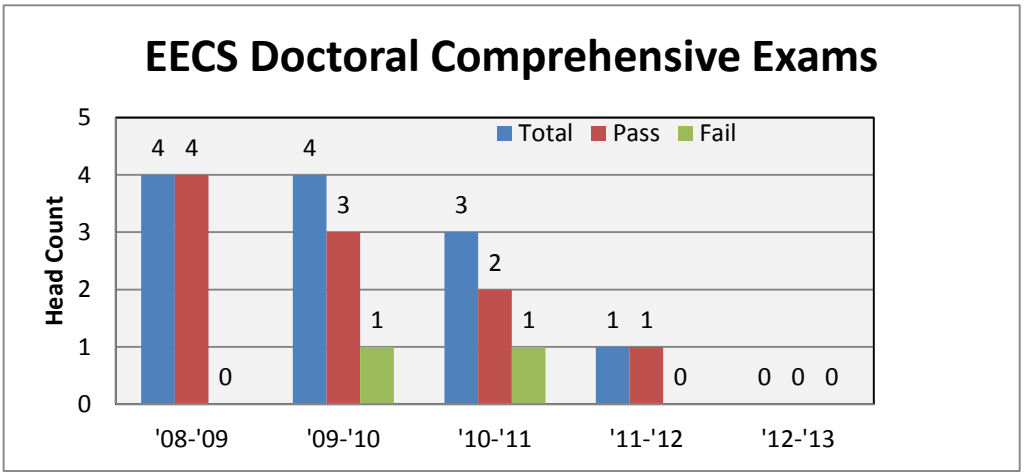


Figure 7: EECS graduate comprehensive exams.

The department has several different types of Master's students. Full-time coursework students, especially those entering from CUA's accelerated Bachelors-Master's program, usually complete the master's degree requirements in one year. Full-time Master's students completing a research thesis usually complete the degree in two years. Progression towards the Master's degree is as expected by the program with most students graduating within 2 or 3 years of admission. Similarly, for the PhD program, full-time students are either funded by faculty research, school provided scholarships, or by their respective governments, or other means. A good number of our PhD students are employed in the local area research institutions and take courses on a part-time basis.

D.2.3 Curricular Improvements

In 2001, the School of Engineering's graduate curriculum committee adopted a standard core curriculum consisting of four graduate level courses from which graduate students must select a minimum of two. For electrical engineering, the appropriate courses are two graduate level math courses (ENGR 516 and ENGR 520) that the department believes to be essential. This curriculum improvement has strengthened the technical training of our graduate students.

Based upon course review sessions between instructor and chair, instructor feedback, student evaluations, and other input, the department has also made additional curricular improvements implemented over the past several years which include:

- Non-common graduate level courses are offered on two year rotations to improve the number of our course offerings and provide a variety of courses available to students;
- All graduate level courses (500+) are required to receive student evaluations in the same manner as undergraduate courses;
- The following new and/or revised graduate courses have been introduced over the past three years:
    - ENGR 652 – Advanced Optical and Image Processing
    - ENGR 543 – Wireless Sensor Networks
    - ENGR 570 – Basics of High Performance Computing for Engineers
    - EE 534 – Communication and Computer Network Simulations (completely revised)
    - EE 540 – Introduction to Antenna Systems

- EE 742 – Time Domain Electromagnetics
- EE 530 – Parallel and Heterogeneous Computing
- CSC 728 – Information Visualization
- CSC 693 – Advanced Topics in Cybersecurity
- CSC 504 – Compiler Construction
- CSC 525 – Embedded Systems Programming
- CSC 513 – Fundamentals of Computer Graphics
- CSC 582 – Computer Graphics and Game Programming
- CSC 581 – Cryptography and Stenography
- EE/CSC 576 - Robotics

In addition to the two off-campus programs with strong electrical engineering components at Naval Surface Warfare Center, Carderock, MD and Army Night Vision Laboratory, Fort Belvoir, VA, a new program with the National Institutes of Health, Bethesda, MD was initiated on network security in 2013.The off-campus programs extend the department's and school's outreach to the local technological sector, and offer inroads to working professionals seeking to further their career potential. Although initially managed by the EECS department, these off-campus courses are now run by the Engineering Management program since academic year 2008-2009.

E Mechanical Engineering

E.1 Assessment Measures

The Department of Mechanical Engineering within the School of Engineering uses the following measures to assess student learning outcomes:

- Review of coursework by major professors, including: exams, homework assignments, course projects (as appropriate), and reports (as appropriate)
- Review of course content by department chair, including textbook, syllabus, topics covered and tools/techniques taught
- Student course evaluations
- Comprehensive Exam (for doctoral students)
- Evaluation of theses (if applicable) by major professors and readers using criteria: originality of work, significance in scientific/engineering research, quality of experimental/computational design, accuracy of data analysis, quality of written report, and oral presentation.

E.2 Assessment Findings

E.2.1 Course Discussion

The Department of Mechanical Engineering in the School of Engineering analyzed course grade, evaluation, and enrollment data in graduate level courses considered to be core to the master's degree for a five-year period (Fall 2008 through Spring 2013). Table 6 below summarizes the statistical findings (i.e. average $\pm$ std err) of the courses.

Table 6: Summary of 5-year course evaluation data for key courses in mechanical engineering.

	ENGR 516	ENGR 520	ENGR 503	ME 530	ME 532	ME 552
Teacher (10=high; 1=low)	**7.67±1.01**	**7.84±1.20**	**7.59±0.86**	**6.50±1.52**	**8.38±0.45**	**8.79±1.04**
Course (10=high; 1=low)	**7.58±0.93**	**7.47±1.10**	**7.30±0.74**	**6.35±1.18**	**8.11±0.25**	**8.73±0.99**
Course Grade (4.0 Scale)	**3.64±0.29**	**3.56±0.33**	**3.37±0.15**	**3.62±0.17**	**3.15±0.16**	**3.29±0.46**
Enrollment (high/low)	**19.27±9.63 (32/4)**	**16.75±10.43 (30/3)**	**45.80±9.01 (59/35)**	**21.20±3.11 (25/18)**	**12.67±3.06 (16/10)**	**20.67±9.50 (30/11)**

ENGR 516 and ENGR 520 are graduate level mathematics courses that are required for all biomedical engineering graduate students. For these courses, enrollment has varied considerably annually. Enrollment in ENGR 516 varied from a low of 4 in Summer 2011 to a high of 32 in Spring 2010 with a healthy average of 19.27. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.67 (teacher) and 7.58 (course) over the five-year period. Average GPA for students taking ENGR 516 varied from a low of 3.18 in Fall 2010 to a high of 3.93 in Summer 2011 with an average of 3.64 ± 0.29. Enrollment in ENGR 520 varied from a low of 3 in Summer 2011 to a high of 30 in Spring 2013 with a healthy average of 16.75. The average evaluation scores for teacher and course are at acceptable levels with an average of 7.84 (teacher) and 7.47 (course) over the five-

year period. Average GPA for students taking ENGR 520 varied from a low of 3.04 in Fall 2008 to a high of 4.0 in Summer 2011 with an average of 3.56 ± 0.33.

Within the Department of Mechanical Engineering, there are four (4) courses considered as core for the Master's program, in addition to the above required courses ENGR 516 and ENGR 520. These are Control Systems (ENGR 503) and Flight (ME 552) for students in mechanical systems specialty area, and Applied Energy Systems (ME 530) and Design of Power and Propulsion Systems (ME 532) for students in thermal systems specialty area. All graduate students are encouraged to take these courses if they are interested in one or both specialties and have not already taken such coursework before. More than half of our Master's students take 2 or more of these 4 core courses. In all of these courses, except ME 530, the scores were above the 70% level expected by the School. ME 530 falls below the desired 70% level, and in fact, has been completely revamped beginning in AY 2012-13 to partially address this concern. Course summary data for all courses listed in Table 6 are supplied in Appendix B. The enrollments are all healthy and student performances are as expected.

At the end of each semester, the department chairperson in conjunction with instructors review the content of each course and obtains feedback from instructors regarding any issues that may have arose during the semester, including technology needs, student feedback, etc. Corrective actions are identified and implemented, as needed.

E.2.2 Masters & Doctoral Progression Data

Enrollment in the Master's and doctoral programs in the Department of Mechanical Engineering (ME) remains at about the same level in the past few years. Figure 8 below shows total graduate enrollment in the ME department over the past 7 years.

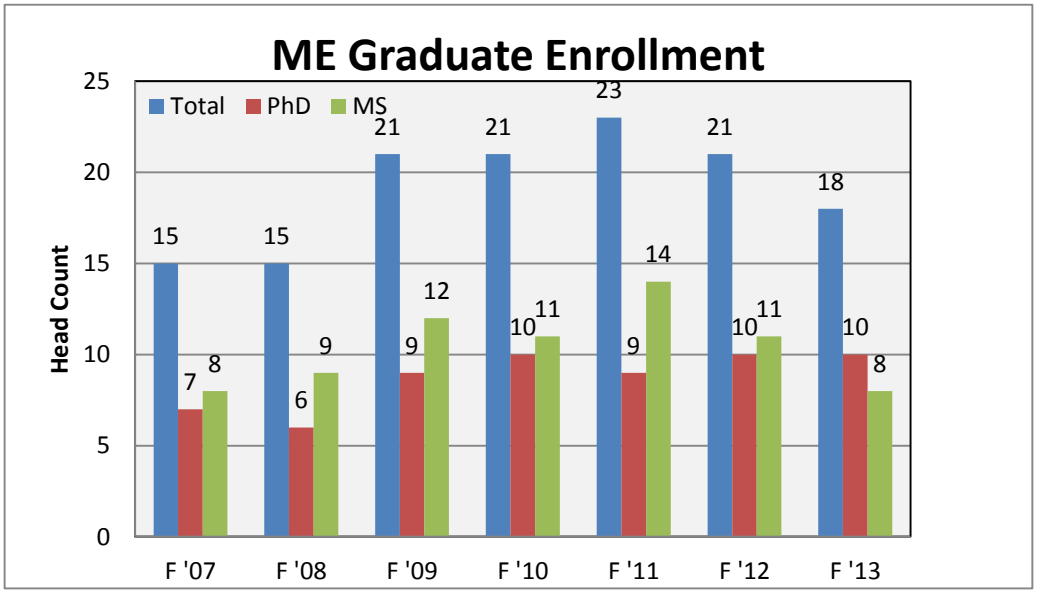


Figure 8: Mechanical engineering graduate enrollment.

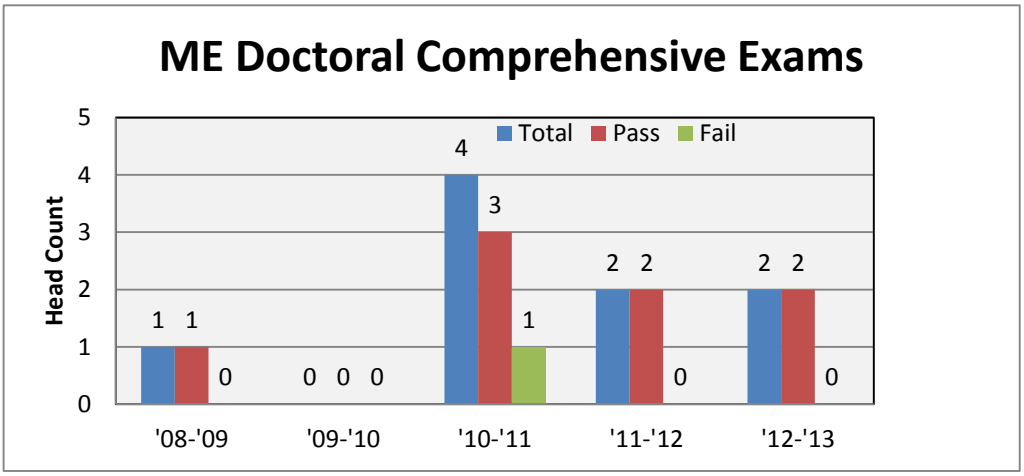


Figure 9: Mechanical engineering doctoral comprehensive exams.

Two off-campus programs with strong mechanical engineering components at the Master's level have been introduced at:

- Naval Surface Warfare Center, Carderock, Maryland, starting in 2002;
- Army Night Vision Laboratory, Fort Belvoir, VA, starting in 2007;

The off-campus programs, in particular, serve to extend the department's and school's outreach to the local technological sector, and offer inroads to working professionals seeking to further their career potential.

E.2.3 Curricular Improvements

In 2001, the School of Engineering's graduate curriculum committee adopted a standard core curriculum consisting of four graduate level courses from which graduate students must select a minimum of two. For Mechanical Engineering, the appropriate courses are two graduate level math courses (ENGR 516 and ENGR 520) that the department believed to be essential. This curriculum improvement has strengthened the technical training of our graduate students.

In addition, the ME department has adopted common courses within two core specialization tracks, Dynamics/Control and Energy/Environment Engineering. Within the Dynamics/Control focus area, common courses include Control Systems (ENGR 503), Modern Control Systems (ME 510), Flight (ME 552), and Vibration and Structural Dynamics I (ME 566). In the area of Energy and Environment, common courses include Applied Energy Systems (ME 530), Design of Power and Propulsion Systems (ME 532), and HVAC&R (ME 533/ME 534). These common courses are offered on a regular basis based on demand.

Based upon course review sessions between instructor and chair, instructor feedback, student evaluations, and other input, the department has also made additional curricular improvements:

- non-common graduate level courses are offered on two year or three year rotations to meet the needs of student and provide a variety of specialty courses and advanced courses

- all graduate level courses (500+) receive student evaluations in the similarly to undergraduate courses

F. School of Engineering-Summary of Findings

Overall, enrollment in the School of Engineering's (SOE) graduate programs has remain consistent over the past 5 years (~170-207 students combined), growing significantly (approximately 70 % over the previous five-year period), with some departments within the school growing significantly. The strong growth has resulted from several off-campus programs, the growing of international programs (2+2 and 3+1), and strong relationships with several embassies, particularly the Saudi Arabian Embassy.

Through examination of the various assessment processes within the School of Engineering, students are achieving the desired program outcomes. Through collective examination of course evaluations, each department's graduate programs are achieving the School's minimum desired targets of 70% achievement in the areas of instructor evaluation, course evaluation, achievement of course objectives, and students' self-assessment of learning.

Periodic reviews of course syllabi by department chairs responsible for each course reveals that course objectives, topics, and tools/techniques taught are appropriate. Wherever necessary, department chairs have worked with individual instructors to continuously assess and implement curricular improvements. These are detailed in the individual reports by each department in Section III above. The School is satisfied that these curricular improvements have been beneficial to improve student learning and achieving student course outcomes.

Average GPA data for key courses in each department/program within the School of Engineering revealed consistent student performance throughout the five-year period.

For master's and doctoral students completing research projects, review of theses and dissertations reveal a high quality level of scientific and engineering research. Several of these students have made multiple oral presentations at engineering conferences and have completed peer-reviewed publications.

In summary, the assessment processes with the School has confirmed that we are achieving our desired outcomes.

Appendix A: Course Summary Data

ENGR 516 and ENGR 520 Course Summary Data

- Attachment A-Course summary data for ENGR 516
- Attachment B-Course summary data for ENGR 520

BE Course Summary Data

- Attachment C-Course summary data for BE 513
- Attachment D-Course summary data for BE 528
- Attachment E-Course summary data for BE 544
- Attachment F-Course summary data for BE 581

CE Course Summary Data

- Attachment G-Course summary data for CE 520
- Attachment H-Course summary data for CE 521
- Attachment I-Course summary data for CE 575
- Attachment J-Course summary data for CE 587

EMP Course Summary Data

- Attachment K-Course summary data for CMGT 505
- Attachment L-Course summary data for CMGT 510
- Attachment M-Course summary data for CMGT 547
- Attachment N-Course summary data for CMGT 572
- Attachment O-Course summary data for CMGT 573
- Attachment P-Course summary data for CMGT 574

EECS Course Summary Data

- Attachment Q: Course summary data for CSC 526
- Attachment R: Course summary data for CSC 531
- Attachment S: Course summary data for CSC 565
- Attachment T: Course summary data for EE 561

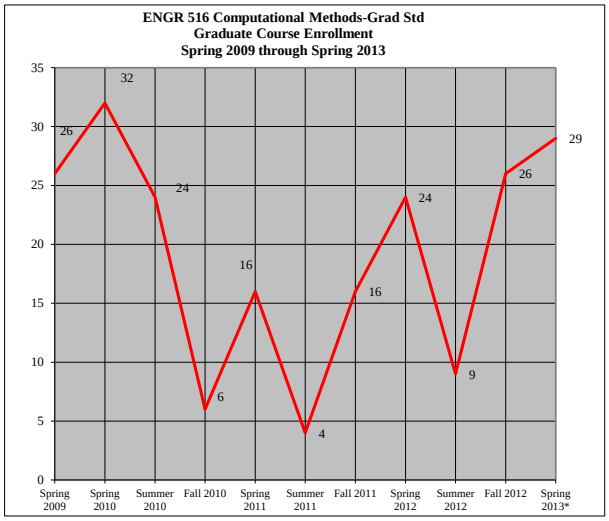
ME Course Summary Data

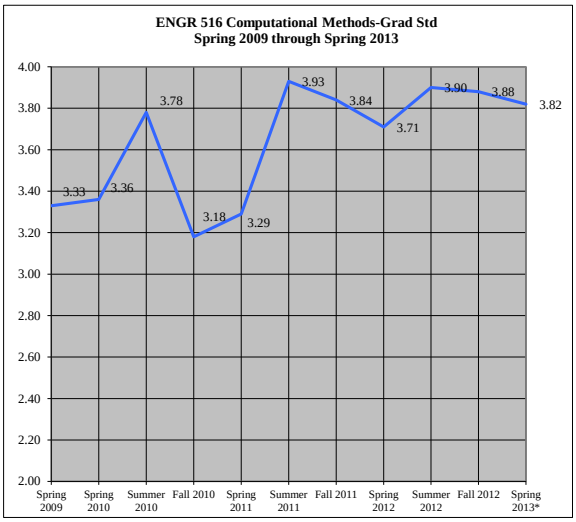
- Attachment U: Course summary data for ENGR 503
- Attachment V: Course summary data for ME 530
- Attachment W: Course summary data for ME 532
- Attachment X: Course summary data for ME 552

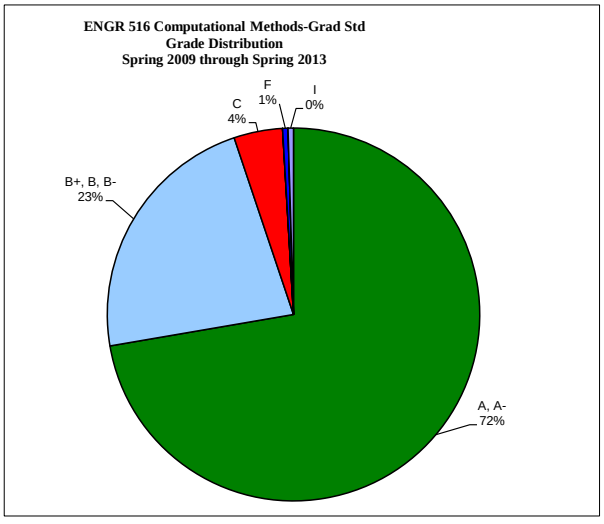
Attachment A: Course summary data for ENGR 516

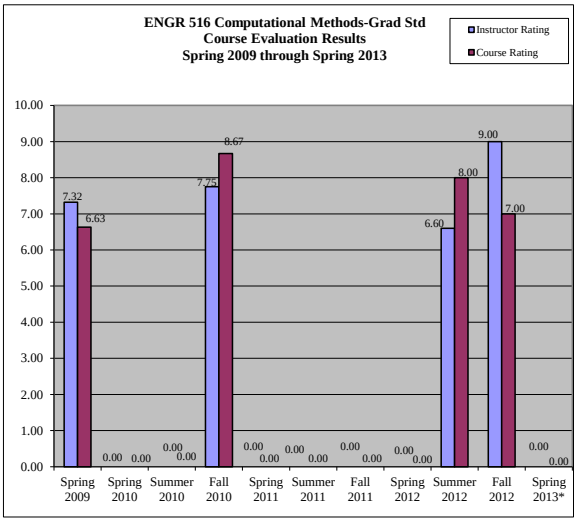
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
ENGR 516 Computational Methods-Grad Std

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	26	3.33	0.65	13	10	3					19	73.08%	7.32	1.49	6.63	1.74
Spring 2010	32	3.36	0.57	14	16	2					0	0.00%				
Summer 2010	24	3.78	0.44	19	5						0	0.00%				
Fall 2010	6	3.18	1.57	5				1			4	66.67%	7.75	1.26	8.67	1.53
Spring 2011	16	3.29	0.71	7	6	3					0	0.00%				
Summer 2011	4	3.93	0.15	4							0	0.00%				
Fall 2011	16	3.84	0.34	14	2					1	0	0.00%				
Spring 2012	24	3.71	0.41	18	6						0	0.00%				
Summer 2012	9	3.90	0.15	9							5	55.56%	6.60	1.67	8.00	1.58
Fall 2012	26	3.88	0.21	24	2						2	7.69%	9.00	1.41	7.00	4.24
Spring 2013*	29	3.82	0.41	27	1	1					0	0.00%				







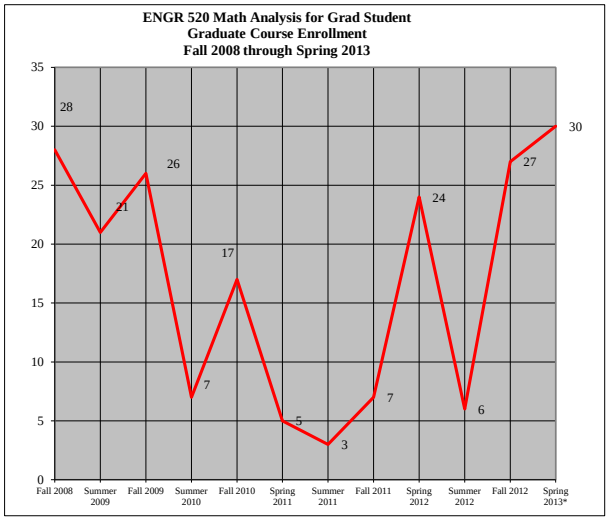


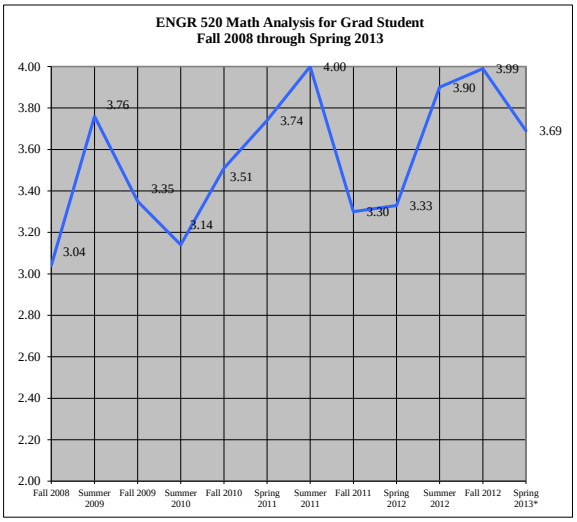
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

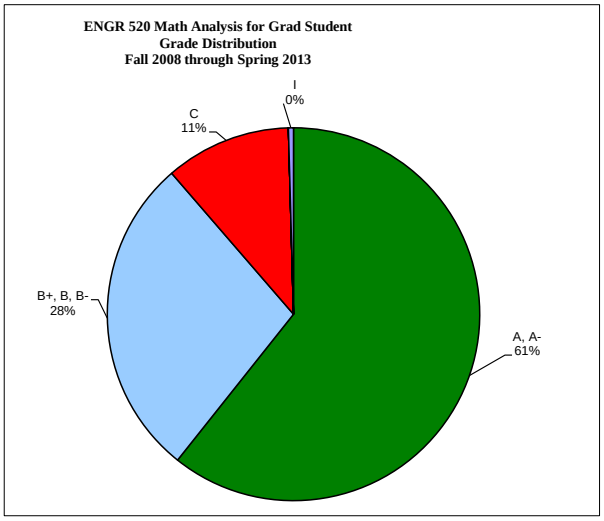
Attachment B: Course summary data for ENGR 520

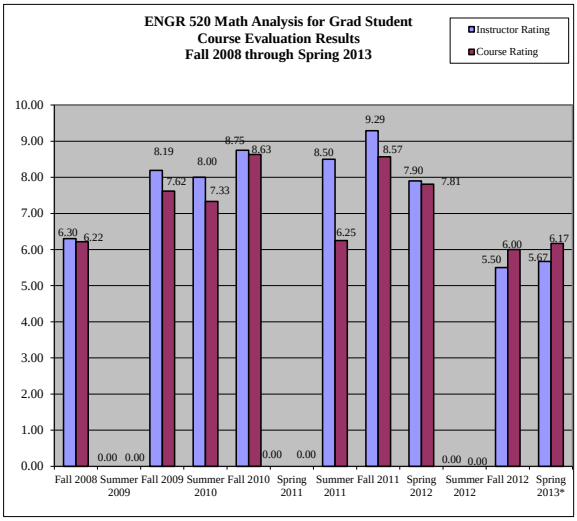
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
ENGR 520 Math Analysis for Grad Student

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	28	3.04	0.87	10	13	4					27	96.43%	6.30	3.23	6.22	3.06
Summer 2009	21	3.76	0.41	16	5	1					0	0.00%				
Fall 2009	26	3.35	0.55	14	11	1					26	100.00%	8.19	1.27	7.62	2.02
Summer 2010	7	3.14	0.82	3	2	2					6	85.71%	8.00	1.14	7.33	1.97
Fall 2010	17	3.51	0.55	10	6	1				1	16	94.12%	8.75	1.91	8.63	1.96
Spring 2011	5	3.74	0.43	4	1						0	0.00%				
Summer 2011	3	4.00	0.00	3	12	15					4	133.33%	8.50	1.73	6.25	2.36
Fall 2011	7	3.30	0.76	4	2	1					7	100.00%	9.29	0.49	8.57	1.27
Spring 2012	24	3.33	0.86	18	6						21	87.50%	7.90	2.86	7.81	2.56
Summer 2012	6	3.90	0.15	6							0	0.00%				
Fall 2012	27	3.99	0.06	27							2	7.41%	5.50	2.12	6.00	1.41
Spring 2013*	30	3.69	0.23	24	6						0	0.00%	5.67	3.83	6.17	3.76







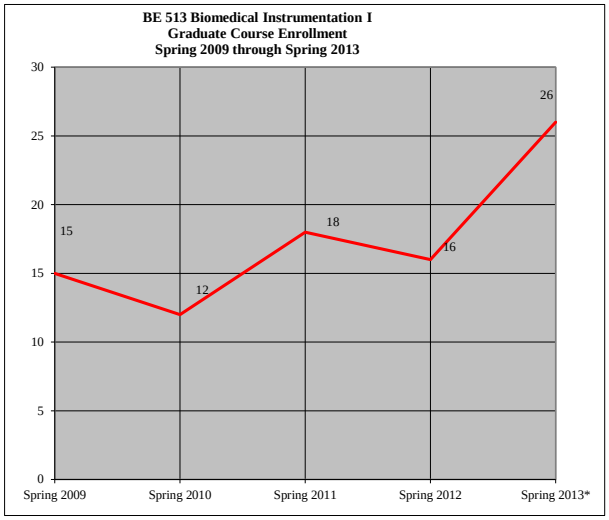


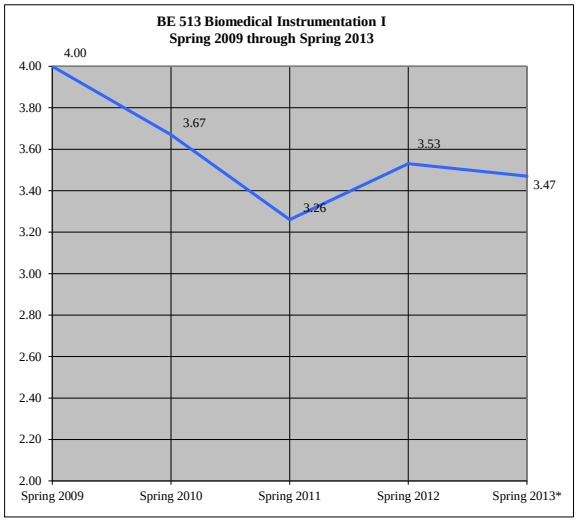
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

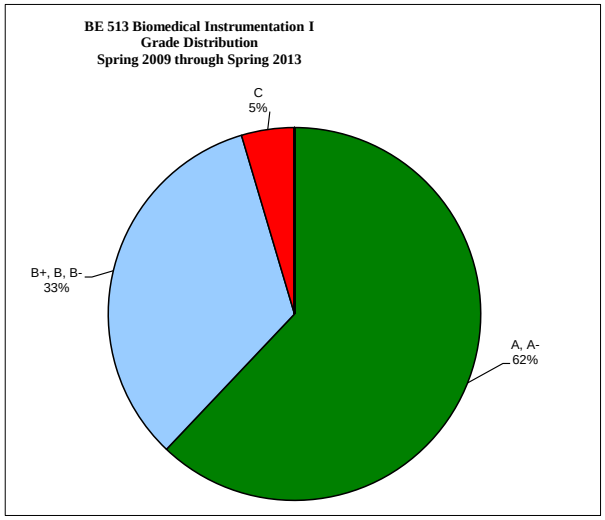
Attachment C: Course summary data for BE 513

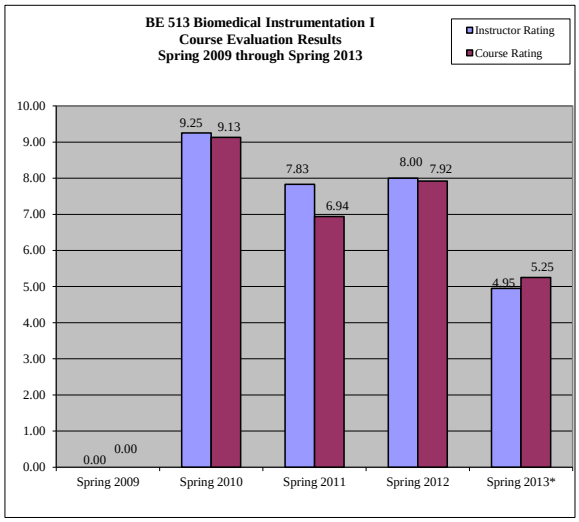
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
BE 513 Biomedical Instrumentation I

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	15	4.00	0.00	15							0	0.00%				
Spring 2010	12	3.67	0.68	9	2	1					8	66.67%	9.25	1.04	9.13	1.36
Spring 2011	18	3.26	0.67	8	7	3					18	100.00%	7.83	1.29	6.94	1.86
Spring 2012	16	3.53	0.47	9	7						12	75.00%	8.00	0.85	7.92	1.44
Spring 2013*	26	3.47	0.44	13	13						20	76.92%	4.95	2.21	5.25	1.86







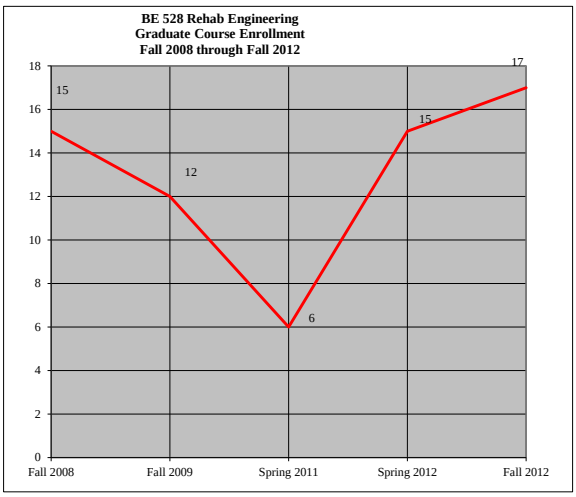


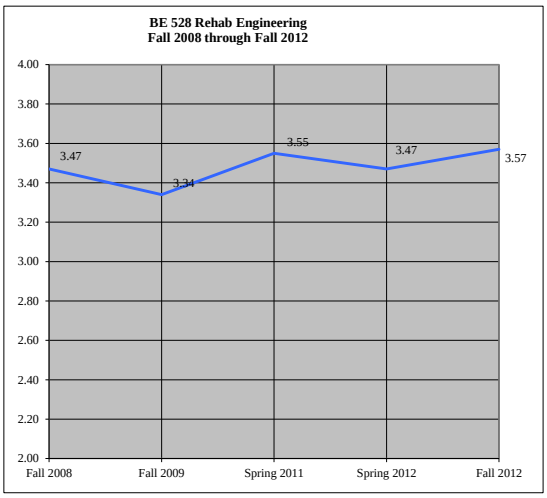
*Spring was using a new evaluation form where instructor and course ratings were based on a 7-point scale

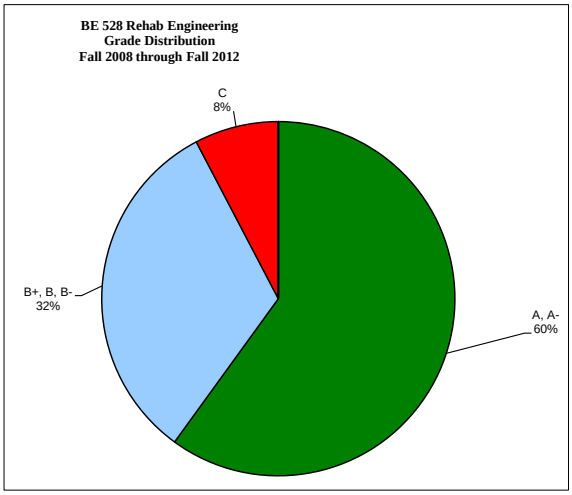
Attachment D: Course summary data for BE 528

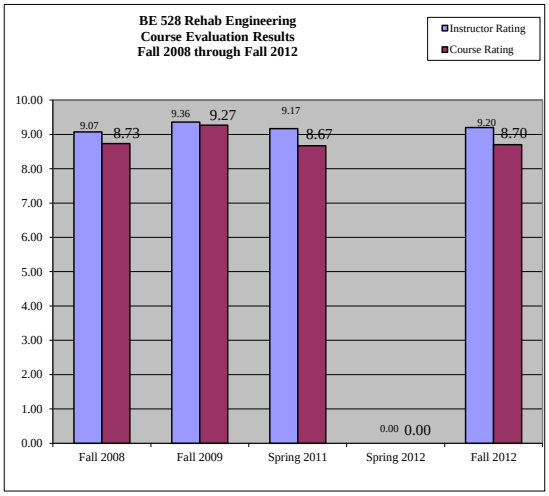
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
BE 528 Rehab Engineering

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	15	3.47	0.45	8	7						15	100.00%	9.07	1.49	8.73	1.53
Fall 2009	12	3.34	0.65	6	5	1					11	91.67%	9.36	0.67	9.27	0.79
Spring 2011	6	3.55	0.41	3	3						6	100.00%	9.17	1.17	8.67	1.51
Spring 2012	15	3.47	0.60	9	5	1					0	0.00%				
Fall 2012	17	3.57	0.73	13	1	3					15	88.24%	9.20	1.08	8.70	1.55





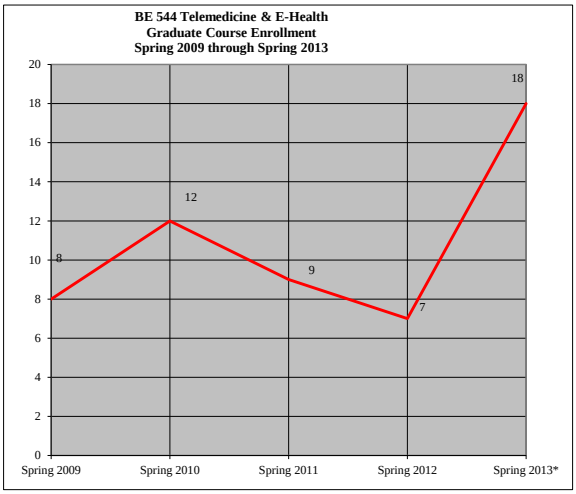


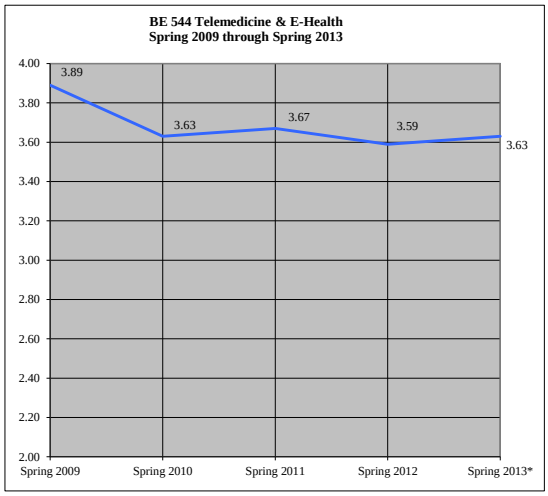


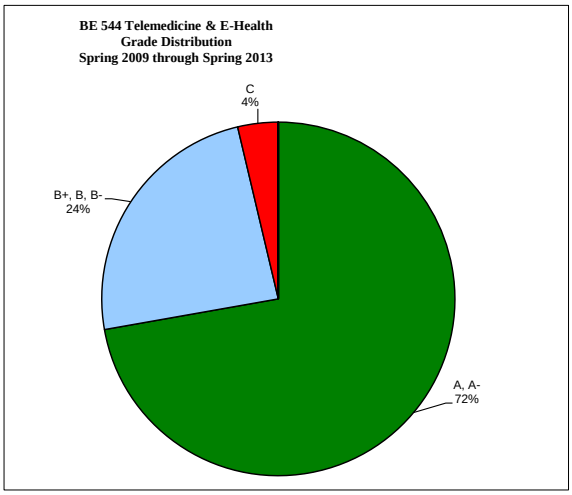
Attachment E: Course summary data for BE 544

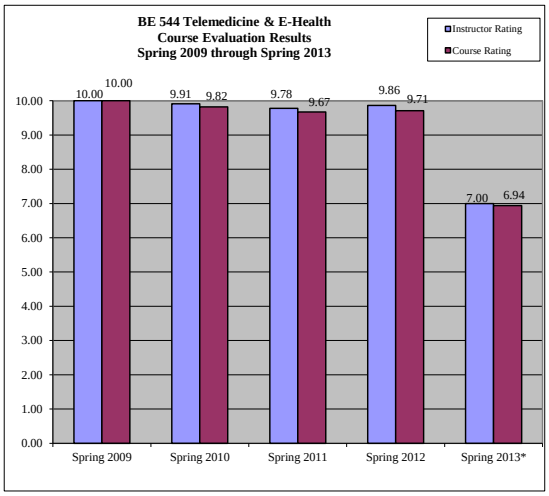
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
BE 544 Telemedicine & E-Health

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	8	3.89	0.16	8							6	75.00%	10.00	0.00	10.00	0.00
Spring 2010	12	3.63	0.42	7	5						11	91.67%	9.91	0.30	9.82	0.60
Spring 2011	9	3.67	0.38	6	3						9	100.00%	9.78	0.44	9.67	0.50
Spring 2012	7	3.59	0.72	6		1					7	100.00%	9.86	0.38	9.71	0.49
Spring 2013*	18	3.63	0.55	12	5	1					18	100.00%	7.00	0.00	6.94	0.24









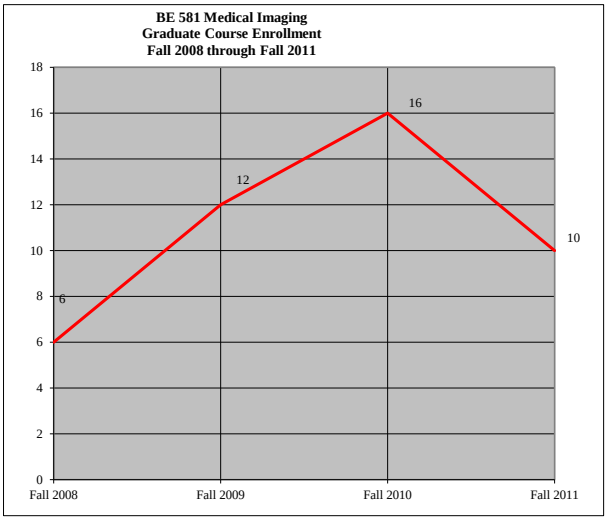
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

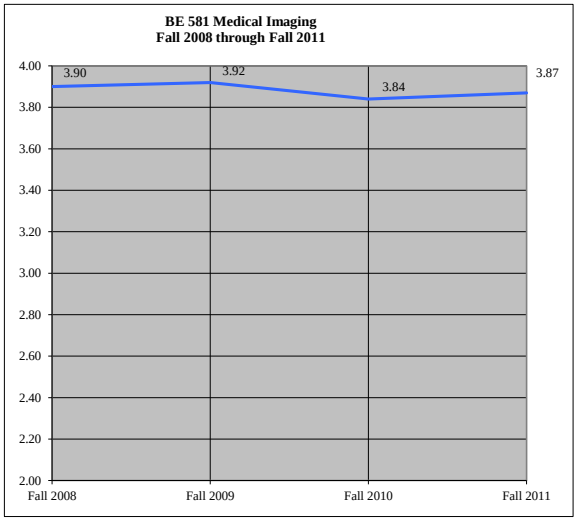
Attachment F: Course summary data for BE 581

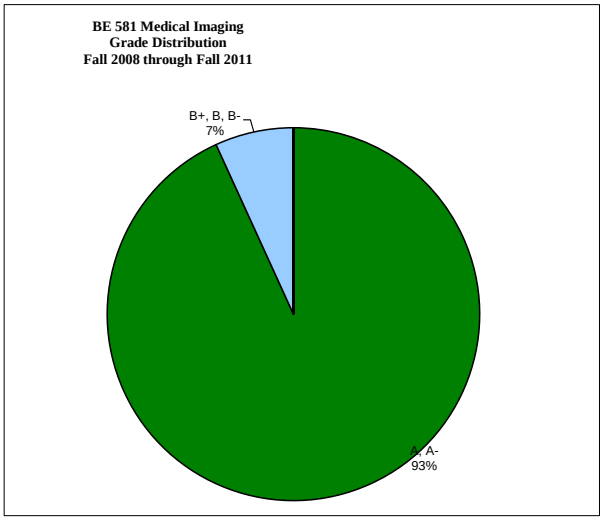
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

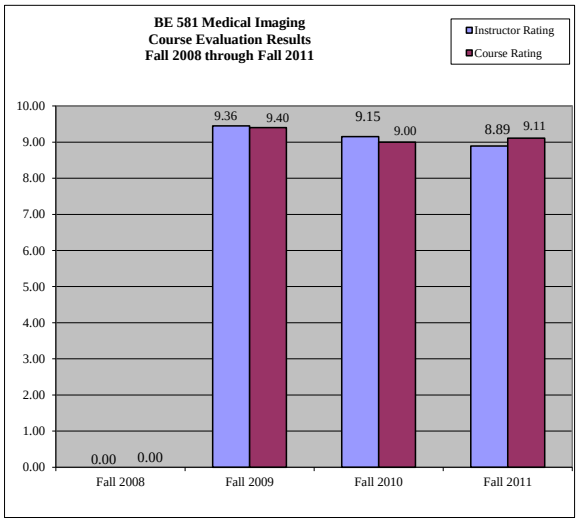
BE 581 Medical Imaging

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	6	3.90	0.15	6							0	0.00%				
Fall 2009	12	3.92	0.21	11	1						11	91.67%	9.45	0.82	9.40	0.84
Fall 2010	16	3.84	0.27	15	1						13	81.25%	9.15	0.80	9.00	1.00
Fall 2011	10	3.87	0.32	9	1						9	90.00%	8.89	0.93	9.11	0.93







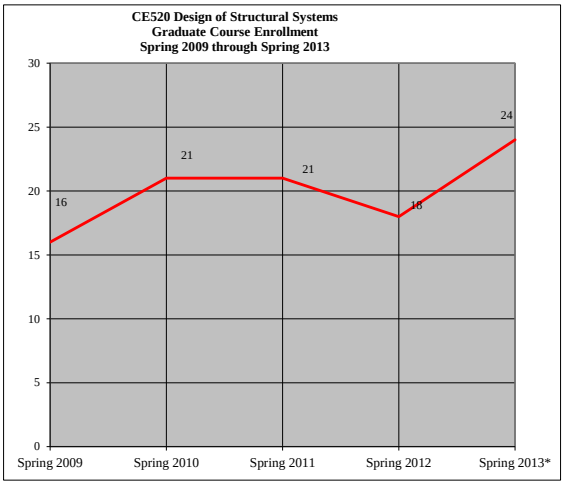


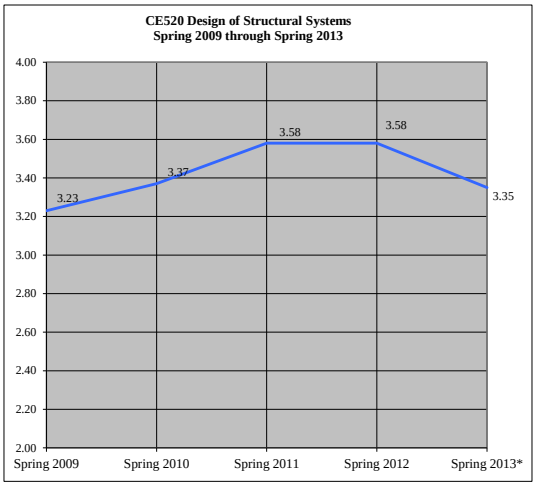
Attachment G: Course summary data for CE 520

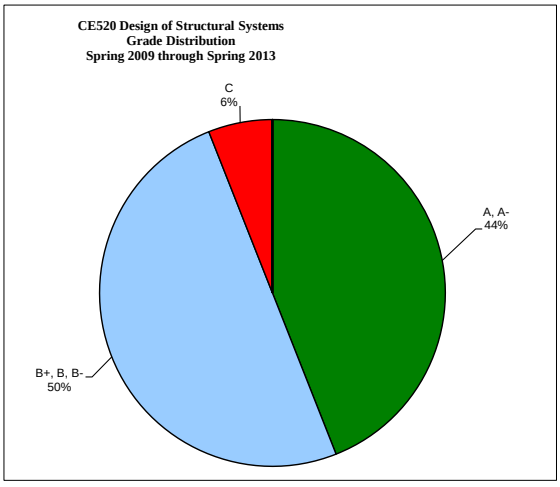
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

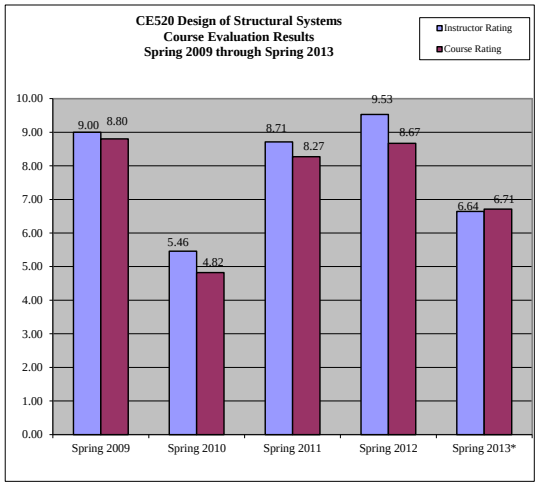
CE520 Design of Structural Systems

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	16	3.23	0.72	6	7	3					15	93.75%	9.00	1.13	8.80	1.42
Spring 2010	21	3.37	0.63	8	11	2					13	61.90%	5.46	2.26	4.82	2.36
Spring 2011	21	3.58	0.41	10	11						14	66.67%	8.71	1.68	8.27	2.02
Spring 2012	18	3.58	0.33	11	7						15	83.33%	9.53	0.92	8.67	2.47
Spring 2013*	24	3.35	0.55	9	14	1					14	58.33%	6.64	0.74	6.71	0.61





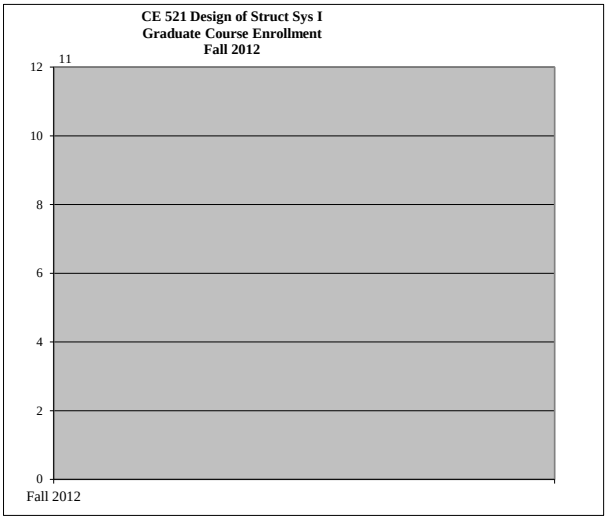


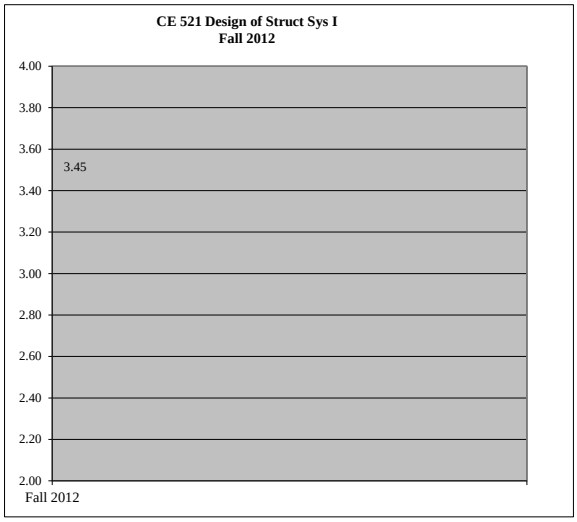


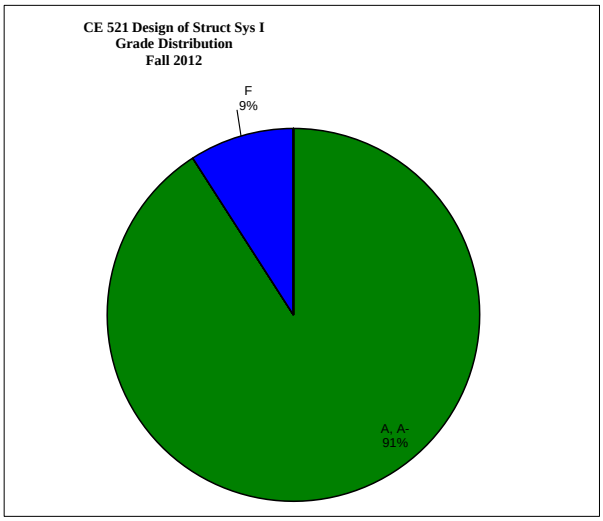
Attachment H: Course summary data for CE 521

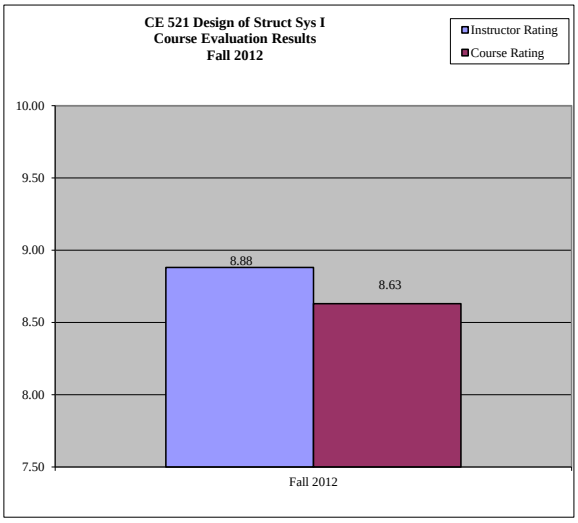
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
CE 521 Design of Struct Sys I

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2012	11	3.45	1.15	10				1			8	72.73%	8.88	1.36	8.63	1.60







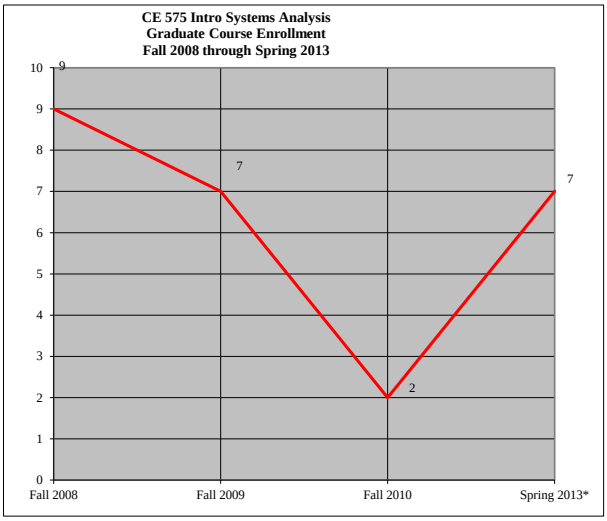


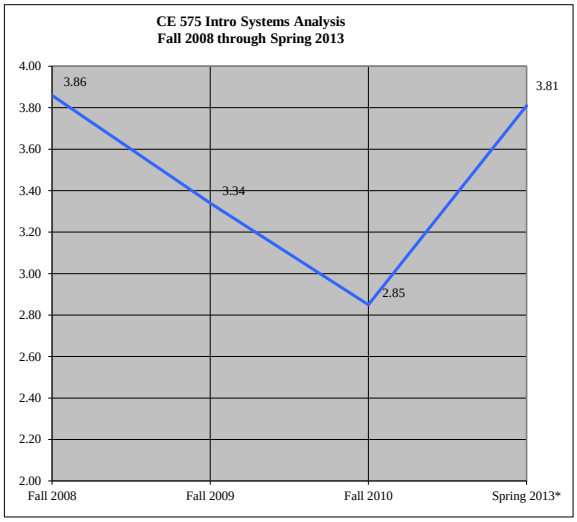
Attachment I: Course summary data for CE 575

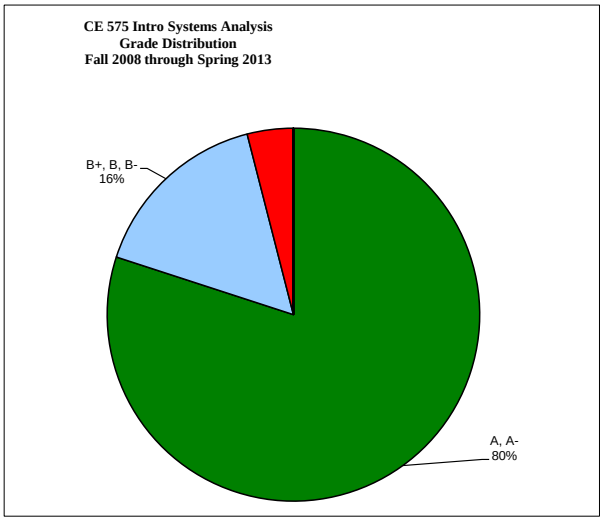
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

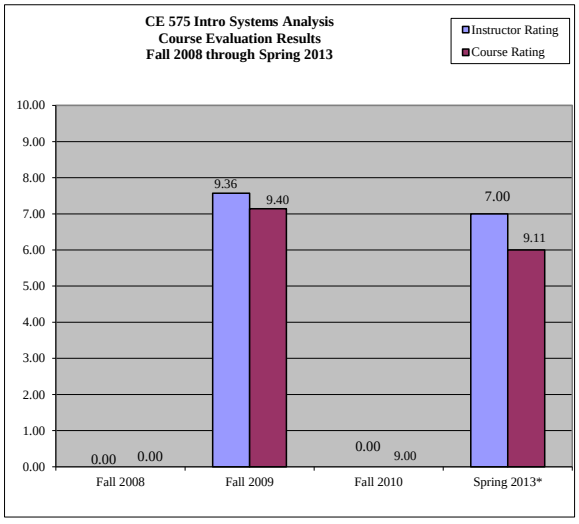
CE 575 Intro Systems Analysis

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	9	3.86	0.34	8	1						0	0.00%				
Fall 2009	7	3.34	0.75	4	2	1					7	100.00%	7.57	0.53	7.14	1.35
Fall 2010	2	2.85	0.21	2							0	0.00%				
Spring 2013*	7	3.81	0.27	6	1						6	85.71%	7.00	0.00	6.00	1.67









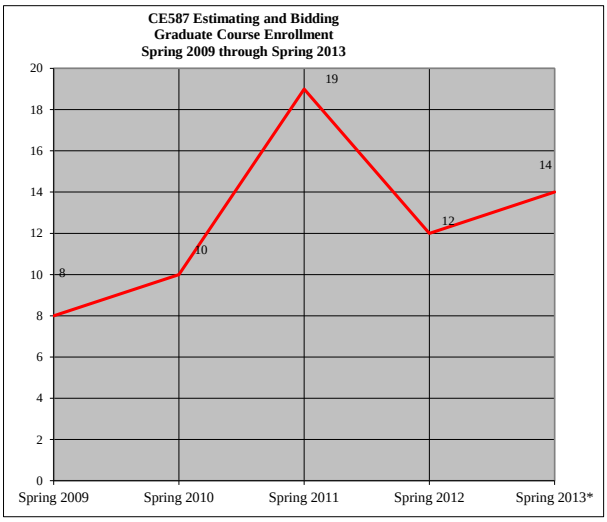
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

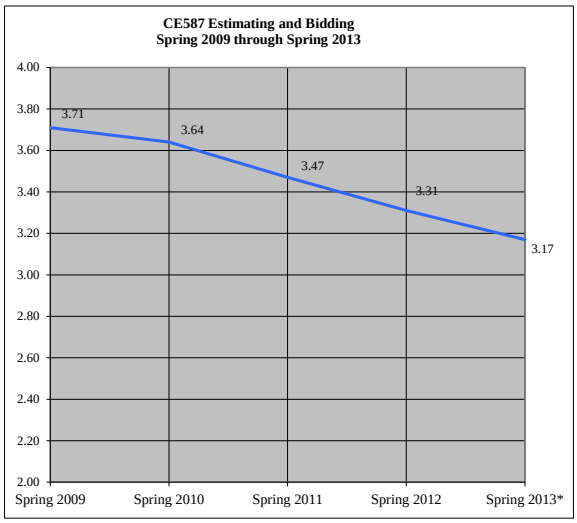
Attachment J: Course summary data for CE 587

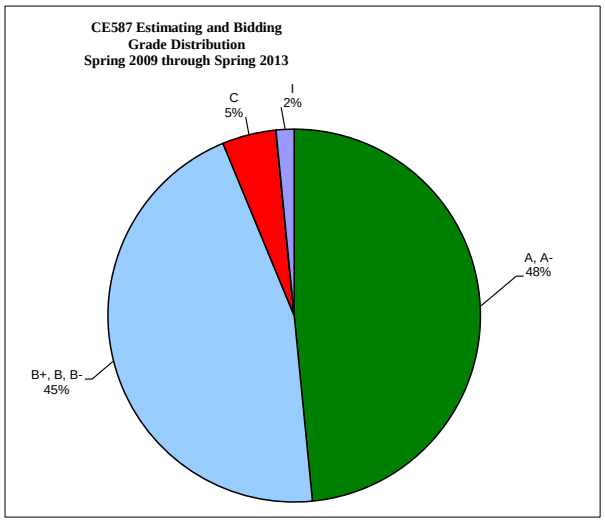
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

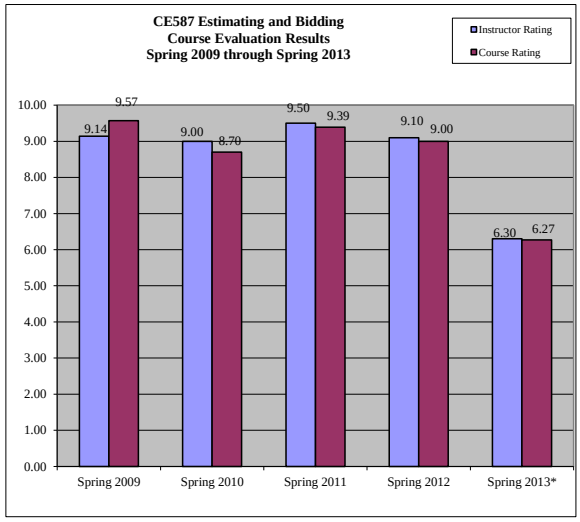
CE587 Estimating and Bidding

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	8	3.71	0.29	6	2						7	87.50%	9.14	0.90	9.57	0.53
Spring 2010	10	3.64	0.34	7	3						10	100.00%	9.00	0.82	8.70	1.25
Spring 2011	19	3.47	0.41	8	11						18	94.74%	9.50	0.79	9.39	0.85
Spring 2012	12	3.31	0.44	4	8						10	83.33%	9.10	0.99	9.00	0.82
Spring 2013*	14	3.17	0.60	6	5	3				1	11	78.57%	6.30	1.64	6.27	1.42







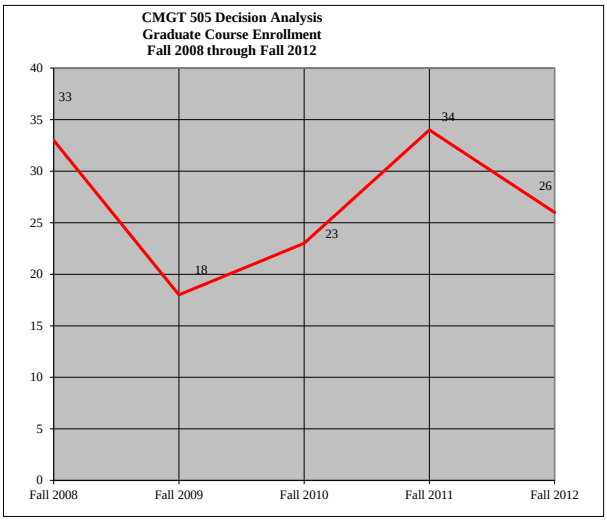


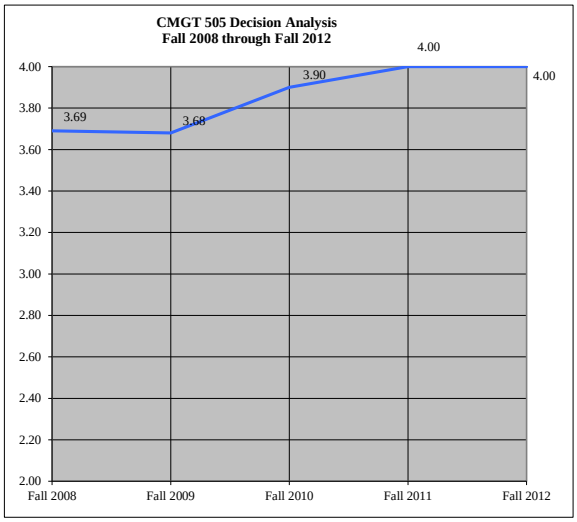
Attachment K: Course summary data for CMGT 505

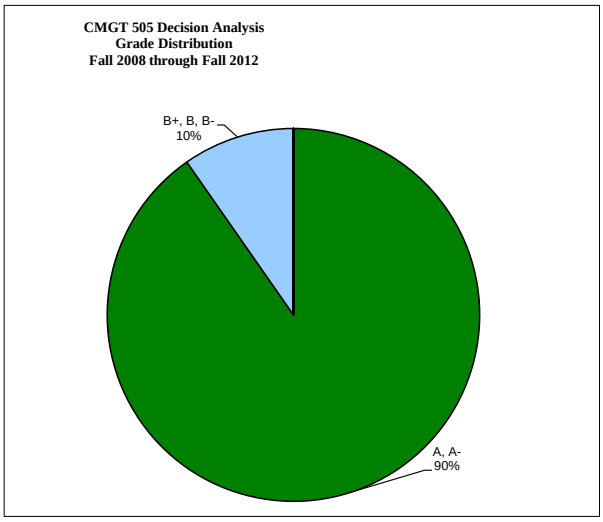
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

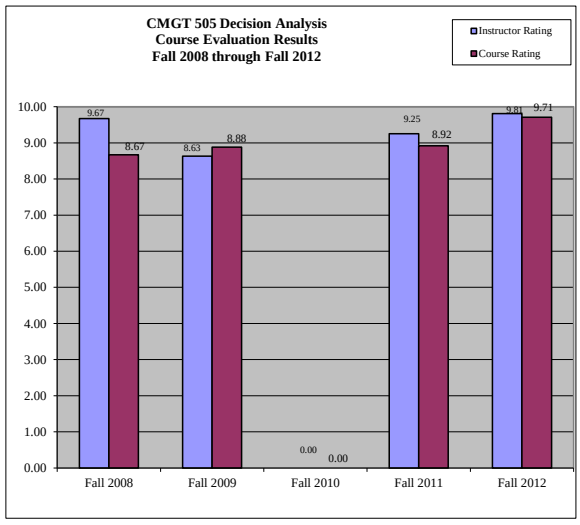
CMGT 505 Decision Analysis

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I		#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	33	3.69	0.28	25	8							18	54.55%	9.67	0.59	8.67	1.33
Fall 2009	18	3.68	0.21	15	3							16	88.89%	8.63	2.47	8.88	1.71
Fall 2010	23	3.90	0.29	21	2							0	0.00%				
Fall 2011	34	4.00	0.00	34								24	70.59%	9.25	1.19	8.92	1.32
Fall 2012	26	4.00	0.00	26								21	80.77%	9.81	0.51	9.71	0.56







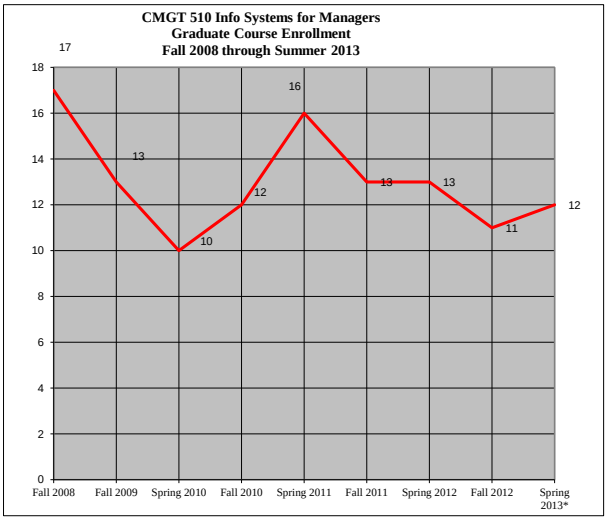


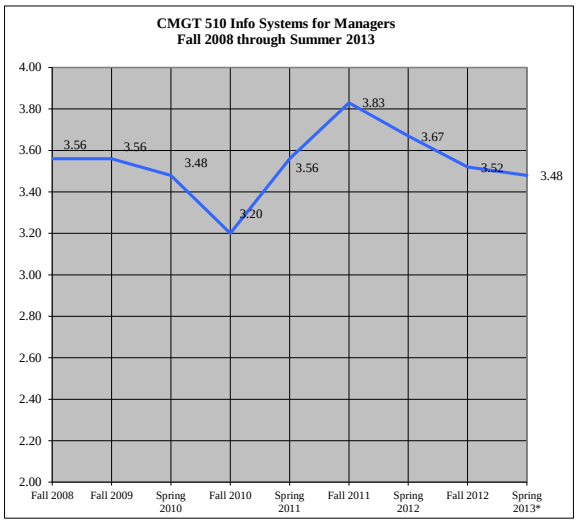
Attachment L: Course summary data for CMGT 510

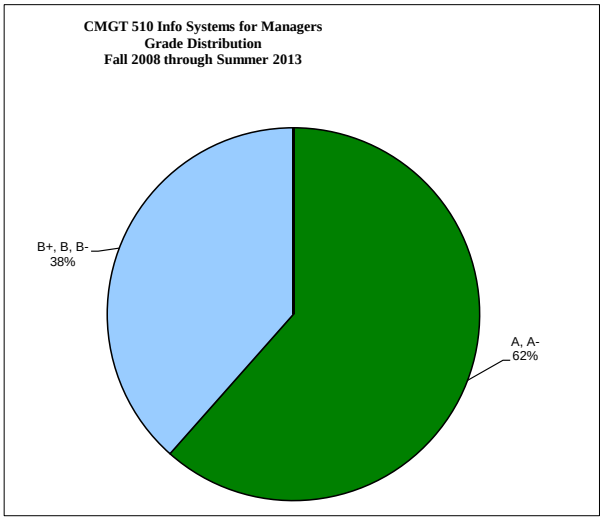
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

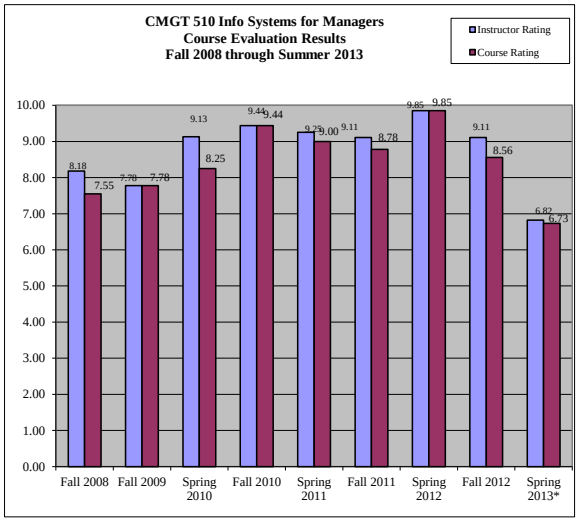
CMGT 510 Info Systems for Managers

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	17	3.56	0.38	12	5						11	64.71%	8.18	2.27	7.55	2.38
Fall 2009	13	3.56	0.46	7	6						9	69.23%	7.78	2.39	7.78	2.54
Spring 2010	10	3.48	0.52	6	4						8	80.00%	9.13	1.13	8.25	1.83
Fall 2010	12	3.20	0.49	3	9						9	75.00%	9.44	0.88	9.44	0.88
Spring 2011	16	3.56	0.39	11	5						4	25.00%	9.25	0.50	9.00	0.82
Fall 2011	13	3.83	0.29	12	1						9	69.23%	9.11	1.69	8.78	1.79
Spring 2012	13	3.67	0.39	9	4						13	100.00%	9.85	0.38	9.85	0.55
Fall 2012	11	3.52	0.36	6	5						9	81.82%	9.11	1.36	8.56	1.74
Spring 2013*	12	3.48	0.44	6	6						11	91.67%	6.82	0.60	6.73	0.65







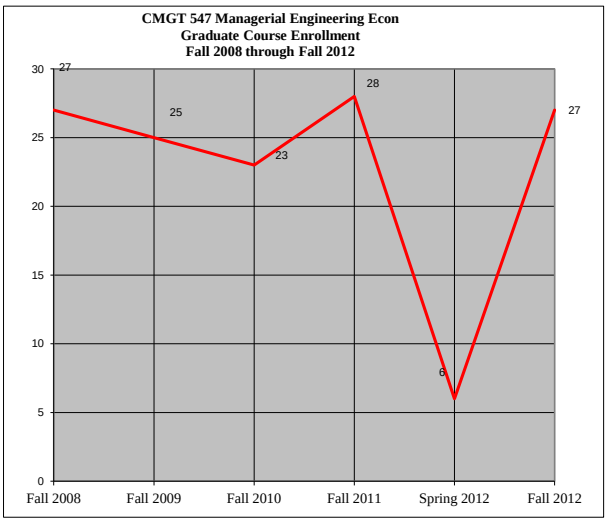


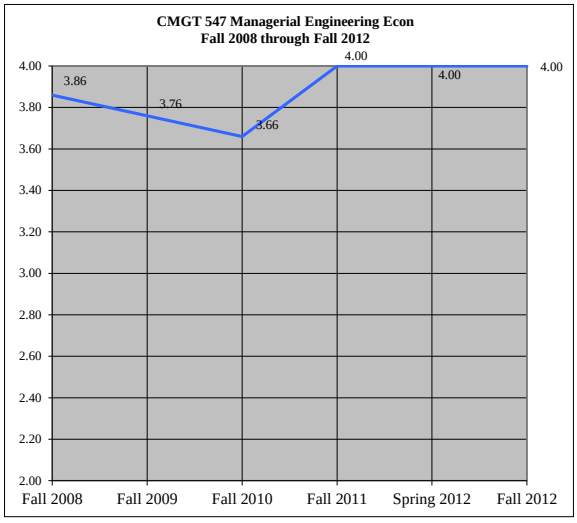
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

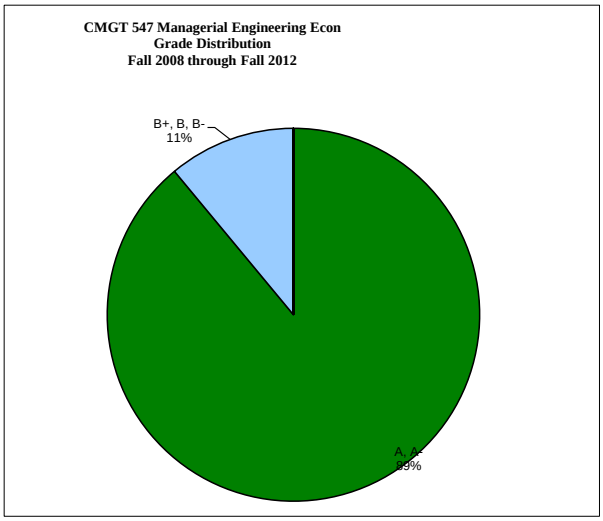
Attachment M: Course summary data for CMGT 547

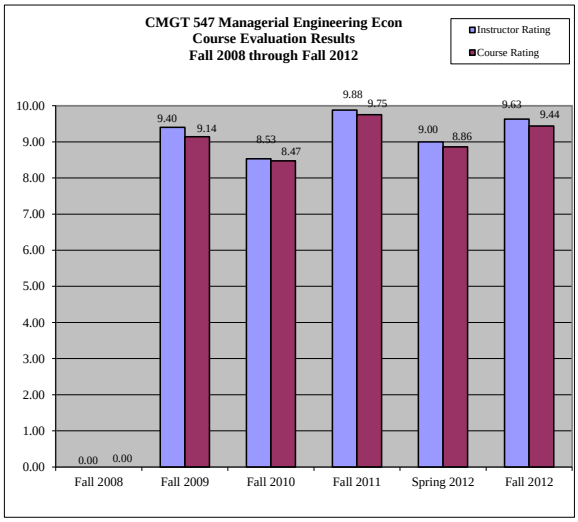
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
CMGT 547 Managerial Engineering Econ

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	27	3.86	0.18	26	1						0	0.00%				
Fall 2009	25	3.76	0.42	18	7						20	80.00%	9.40	0.94	9.14	1.35
Fall 2010	23	3.66	0.47	16	7						17	73.91%	8.53	1.23	8.47	1.18
Fall 2011	28	4.00	0.00	28							8	28.57%	9.88	0.35	9.75	0.46
Spring 2012	6	4.00	0.00	6							7	116.67%	9.00	0.82	8.86	0.90
Fall 2012	27	4.00	0.00	27							16	59.26%	9.63	0.81	9.44	1.03







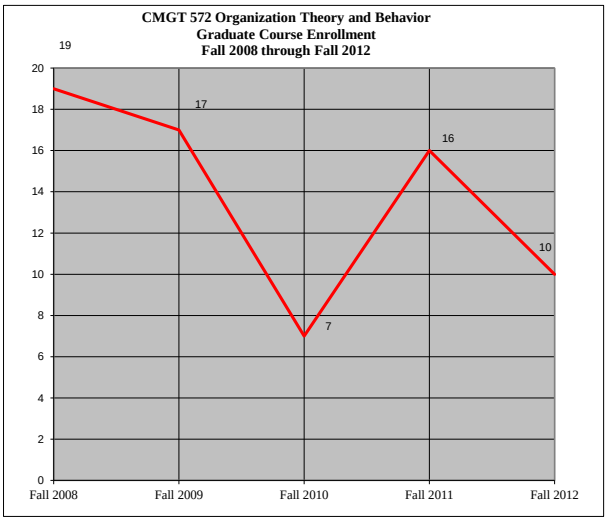


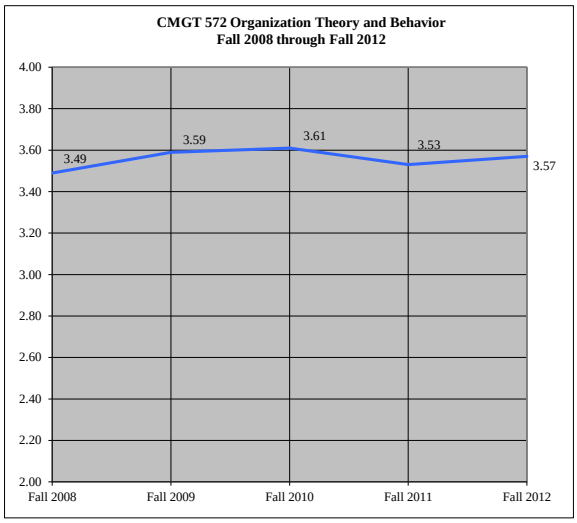
Attachment N: Course summary data for CMGT 572

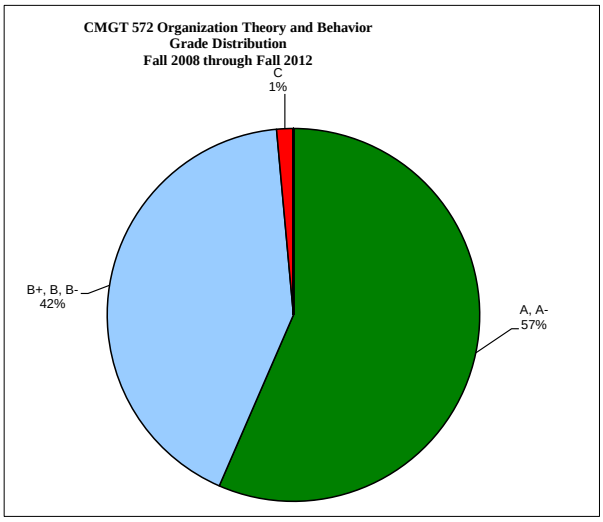
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

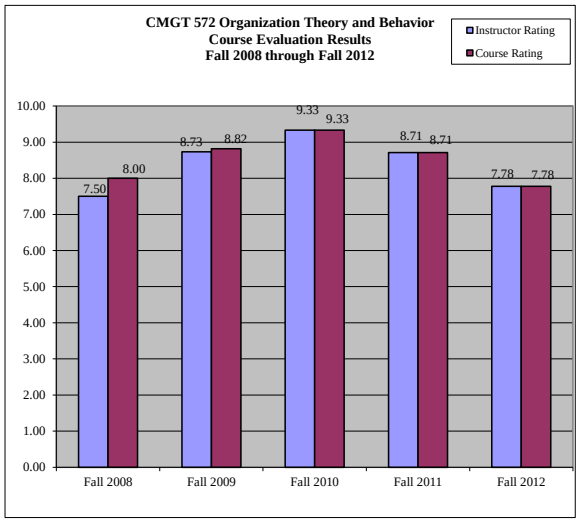
CMGT 572 Organization Theory and Behavior

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	19	3.49	0.37	9	10						2	10.53%	7.50	3.54	8.00	2.83
Fall 2009	17	3.59	0.36	10	7						11	64.71%	8.73	1.35	8.82	1.17
Fall 2010	7	3.61	0.32	4	3						6	85.71%	9.33	0.82	9.33	1.21
Fall 2011	16	3.53	0.56	10	5	1					14	87.50%	8.71	0.99	8.71	0.99
Fall 2012	10	3.57	0.45	6	4						9	90.00%	7.78	2.05	7.78	1.79







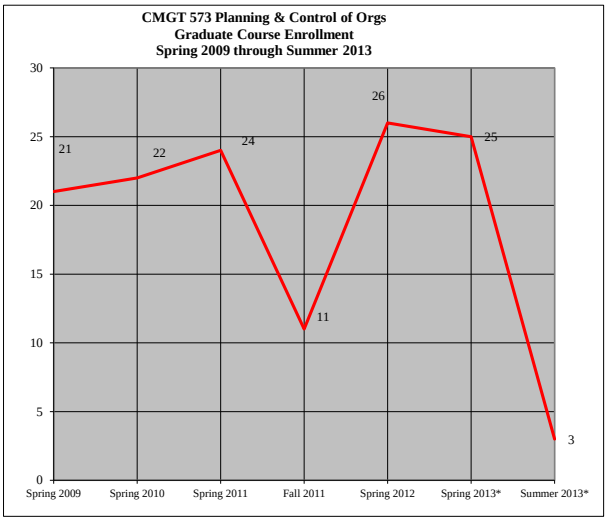


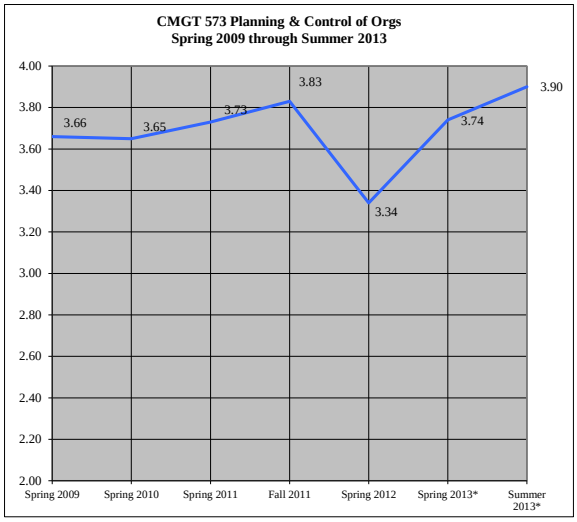
Attachment O: Course summary data for CMGT 573

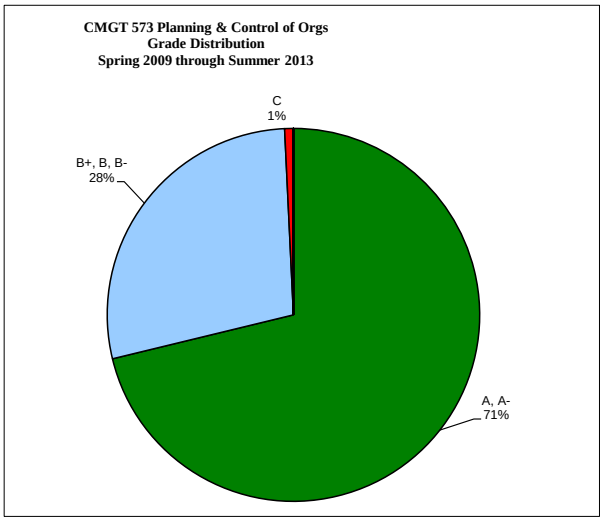
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

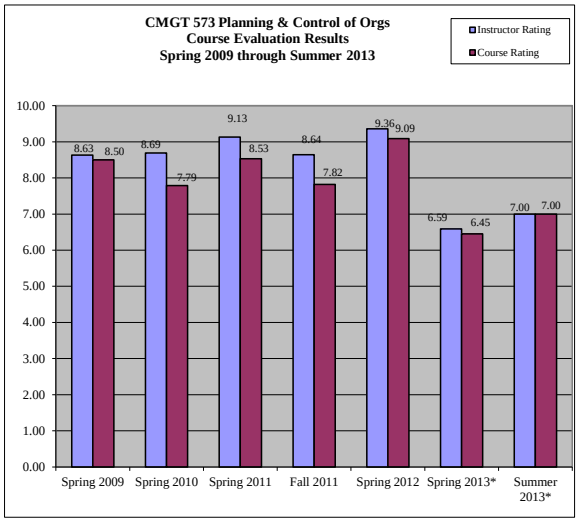
CMGT 573 Planning & Control of Orgs

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	21	3.66	0.40	15	6						16	76.19%	8.63	1.09	8.50	1.26
Spring 2010	22	3.65	0.40	15	7						13	59.09%	8.69	1.49	7.79	2.01
Spring 2011	24	3.73	0.41	19	5						15	62.50%	9.13	0.64	8.53	0.83
Fall 2011	11	3.83	0.31	10	1						11	100.00%	8.64	1.03	7.82	0.75
Spring 2012	26	3.34	0.54	12	13	1					22	84.62%	9.36	0.95	9.09	1.51
Spring 2013*	25	3.74	0.35	20	5						22	88.00%	6.59	0.73	6.45	0.80
Summer 2013*	3	3.90	0.17	3							3	100.00%	7.00	0.00	7.00	0.00





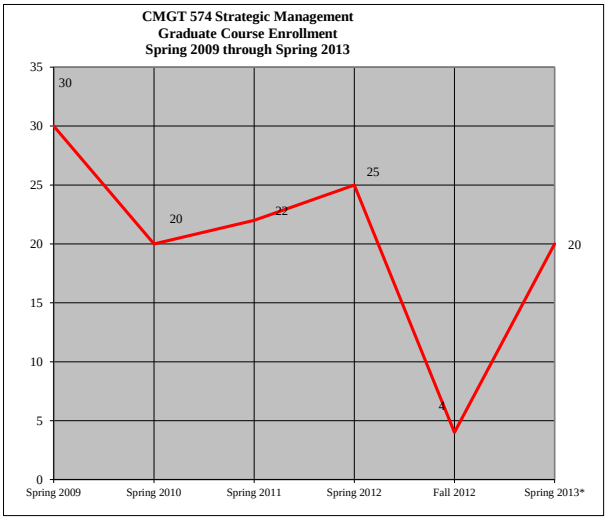


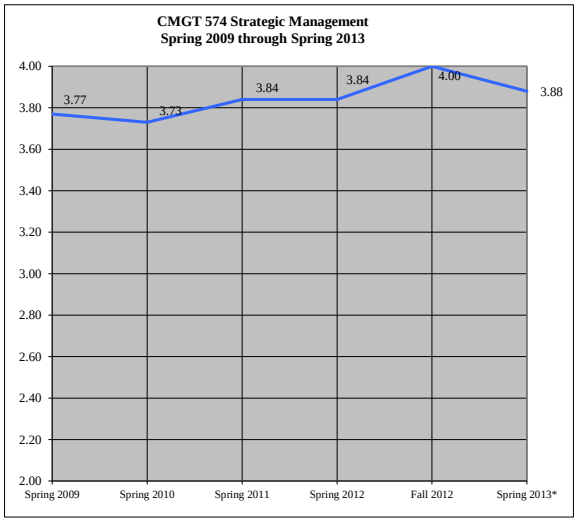


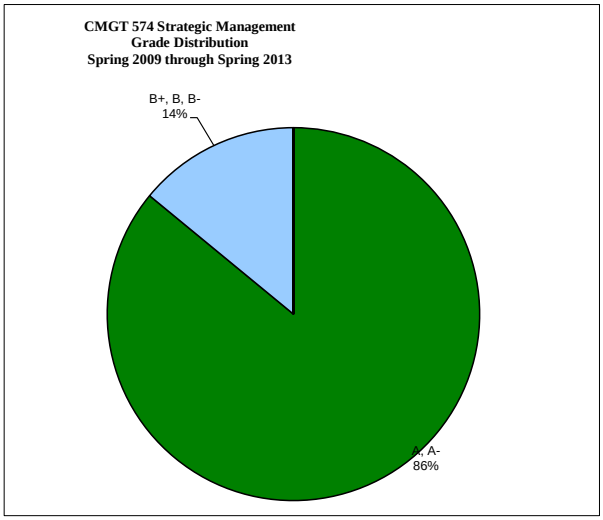
Attachment P: Course summary data for CMGT 574

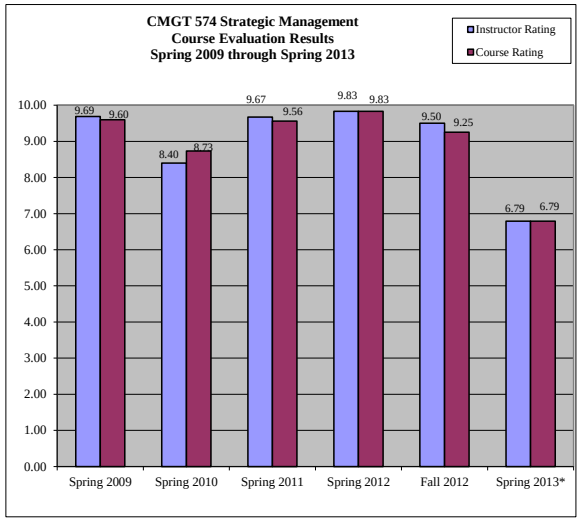
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
CMGT 574 Strategic Management

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	30	3.77	0.31	25	5						26	86.67%	9.69	0.62	9.60	0.71
Spring 2010	20	3.73	0.38	14	6						15	75.00%	8.40	2.20	8.73	1.53
Spring 2011	22	3.84	0.22	20	2						9	40.91%	9.67	0.71	9.56	0.73
Spring 2012	25	3.84	0.24	22	3						24	96.00%	9.83	0.64	9.83	0.64
Fall 2012	4	4.00	0.00	4							4	100.00%	9.50	0.58	9.25	0.50
Spring 2013*	20	3.88	0.24	19	1						14	70.00%	6.79	0.58	6.79	0.58







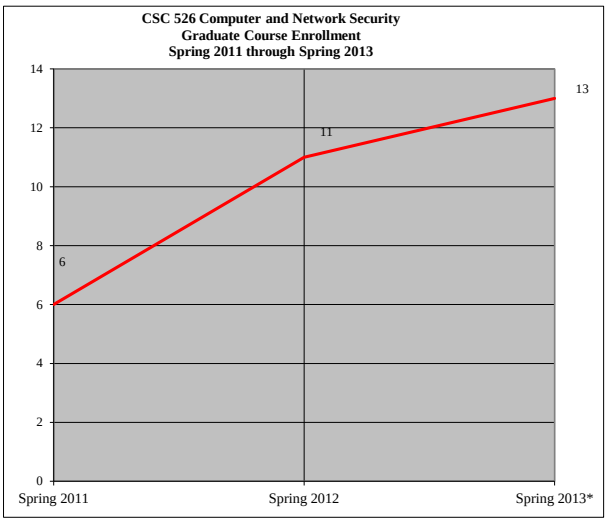


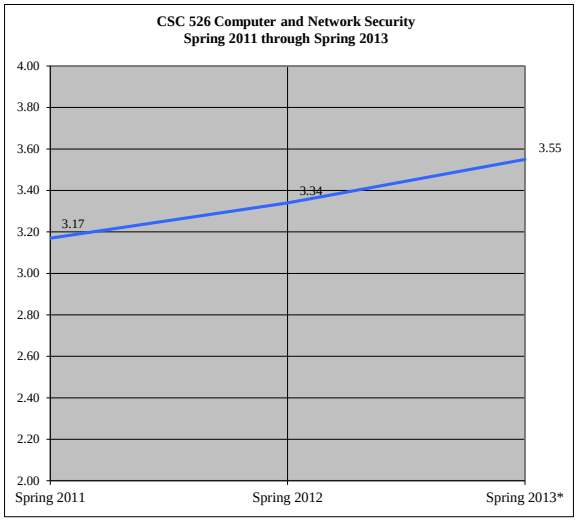
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

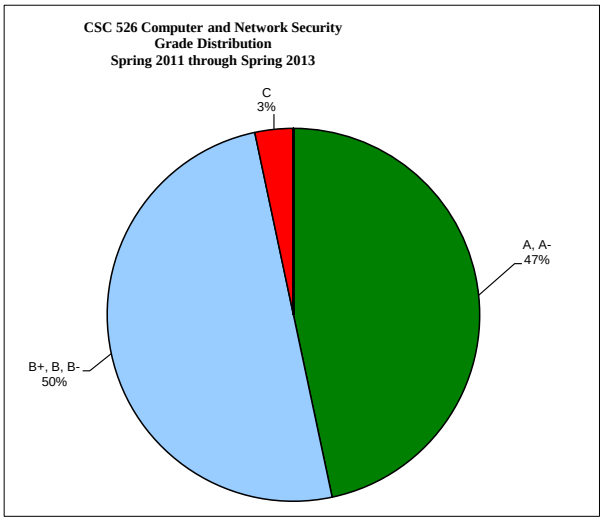
Attachment Q: Course summary data for CSC 526

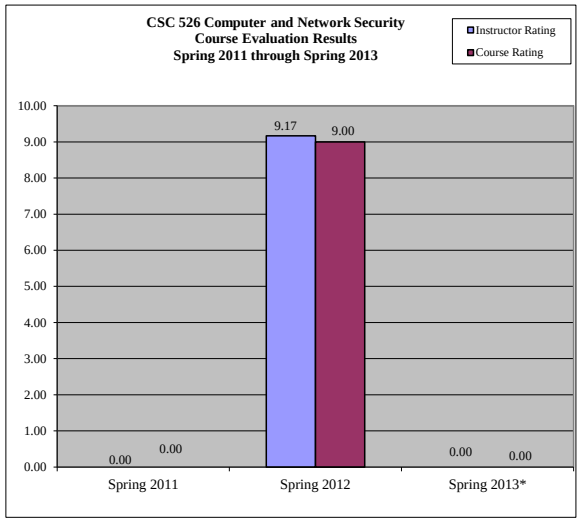
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
CSC 526 Computer and Network Security

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2011	6	3.17	0.86	2	3	1					0	0.00%				
Spring 2012	11	3.34	0.47	4	7						6	54.55%	9.17	0.75	9.00	0.89
Spring 2013*	13	3.55	0.38	8	5						0	0.00%				







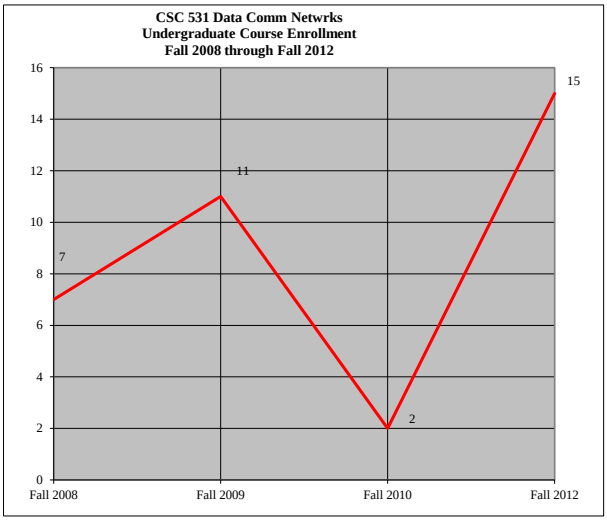


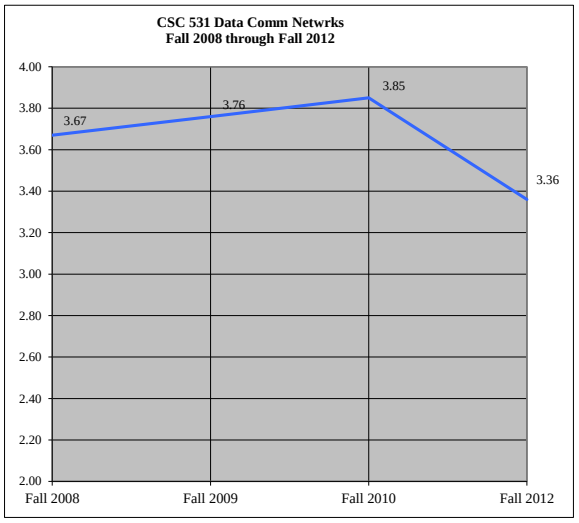
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

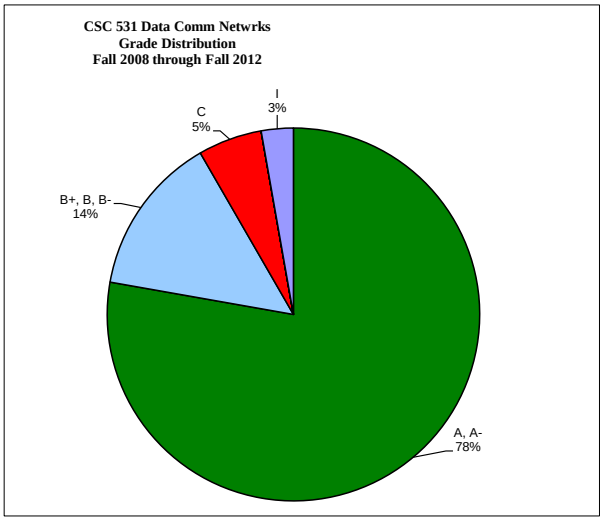
Attachment R: Course summary data for CSC 531

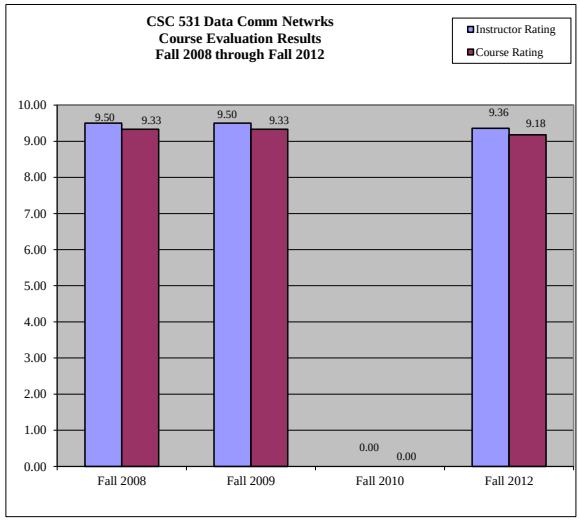
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
CSC 531 Data Communications Networks

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Undergraduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I		#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	7	3.67	0.39	5	2					1		6	85.71%	9.50	0.84	9.33	0.82
Fall 2009	11	3.76	0.27	9	2							6	54.55%	9.50	0.84	9.33	0.82
Fall 2010	2	3.85	0.21	2								0	0.00%				
Fall 2012	15	3.36	0.69	12	1	2						11	73.33%	9.36	1.21	9.18	0.87









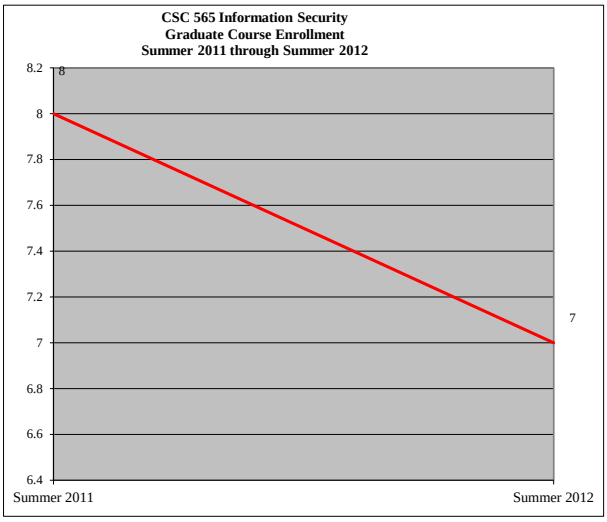
Attachment S: Course summary data for CSC 565

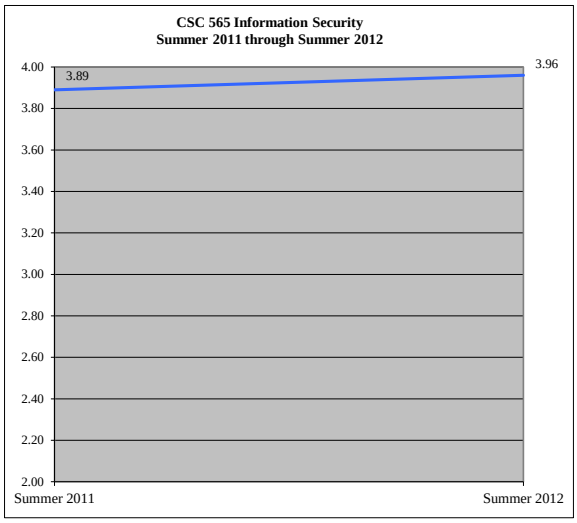
Attachment S: Course summary data for CSC 565

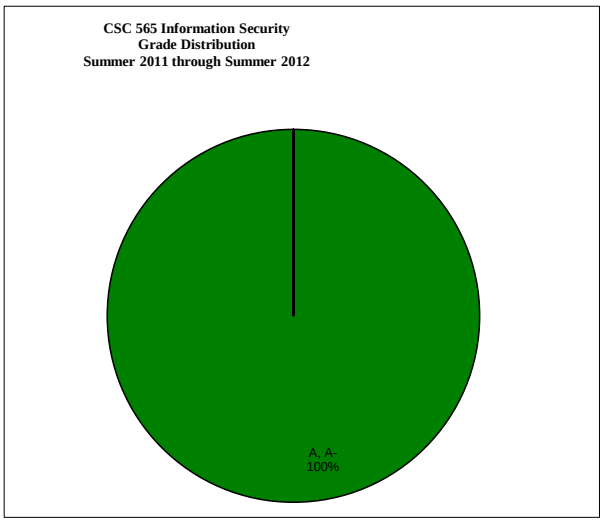
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

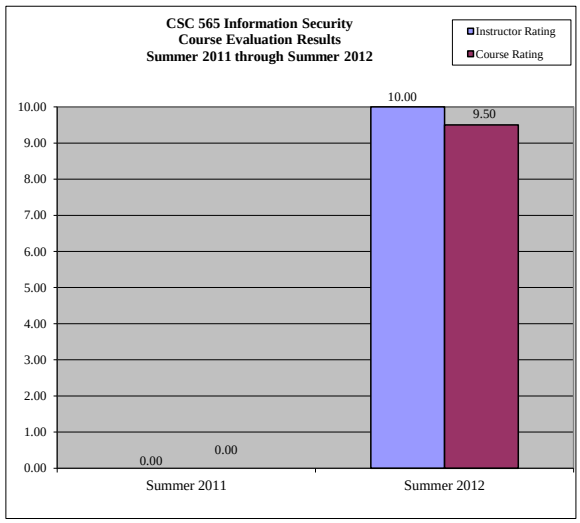
CSC 565 Information Security

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I		#	%	Avg.	StDev.	Avg.	StDev.
Summer 2011	8	3.89	0.16	8								0	0.00%				
Summer 2012	7	3.96	0.11	7								3	42.86%	10.00	0.00	9.50	0.71







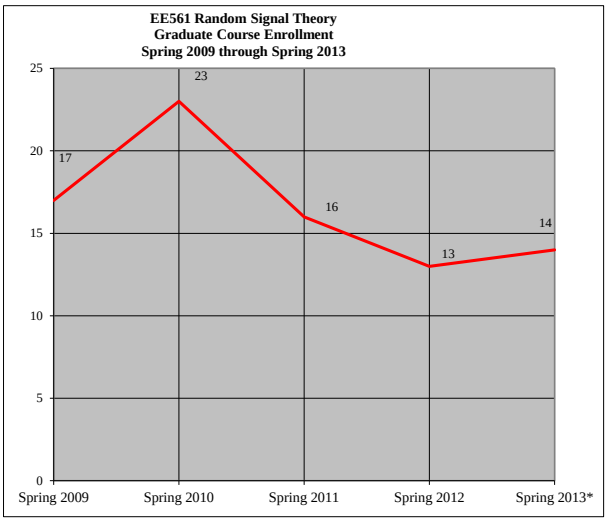


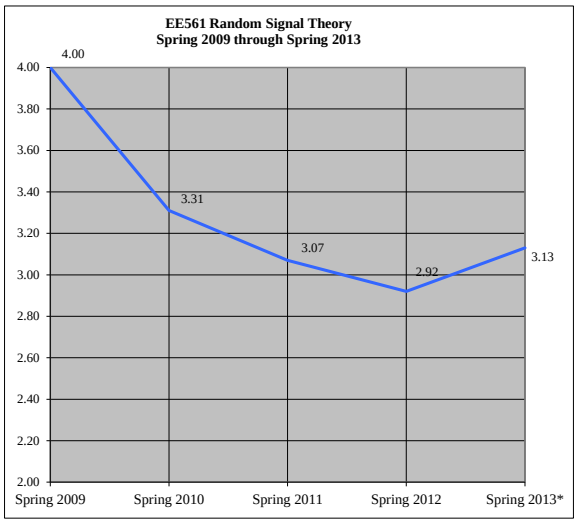
Attachment T: Course summary data for EE 561

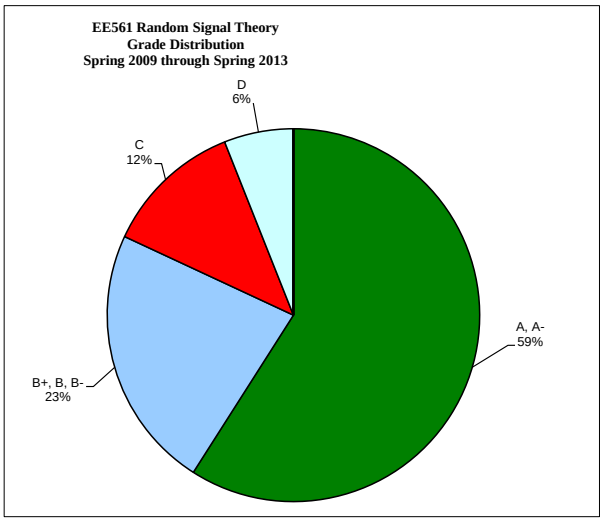
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

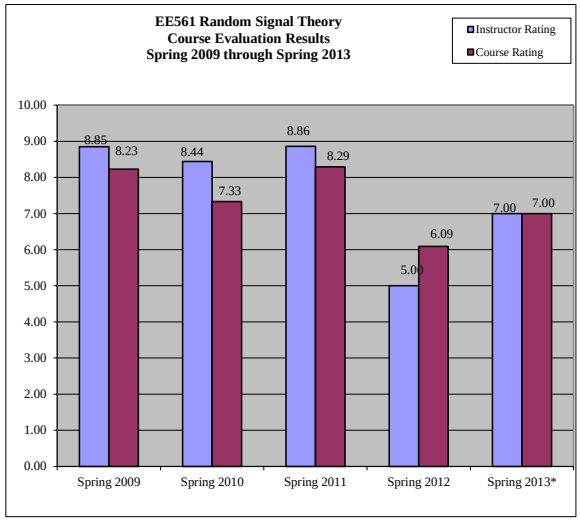
EE561 Random Signal Theory

		Course Grades									Course Evaluation Results					
		Course Grade		Grade Distribution							Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	17	4.00	0.00	17							13	76.47%	8.85	1.14	8.23	1.36
Spring 2010	23	3.31	0.83	12	8	2	1				9	39.13%	8.44	1.51	7.33	1.58
Spring 2011	16	3.07	1.12	8	4	2	2				14	87.50%	8.86	1.03	8.29	1.20
Spring 2012	13	2.92	1.00	5	3	4	1				10	76.92%	5.00	3.53	6.09	3.11
Spring 2013*	14	3.13	0.87	7	4	2	1				9	64.29%	7.00	0.00	7.00	0.00









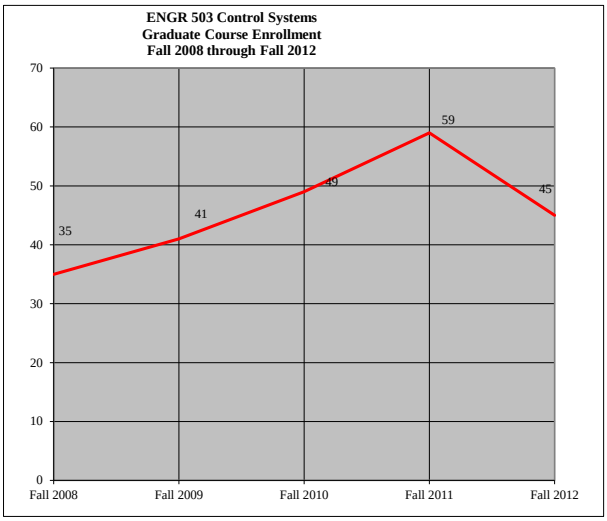
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

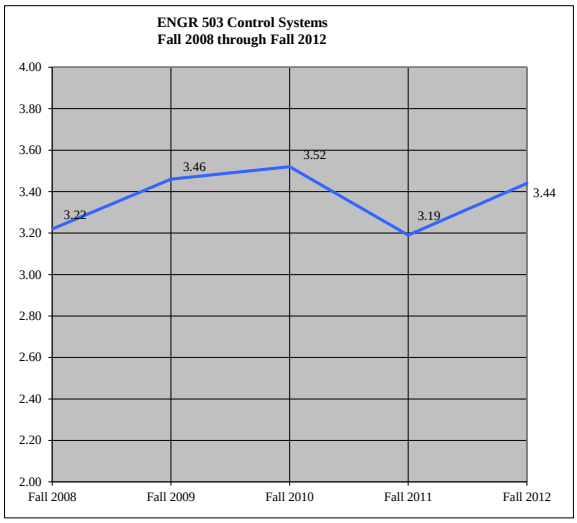
Attachment U: Course summary data for ENGR 503

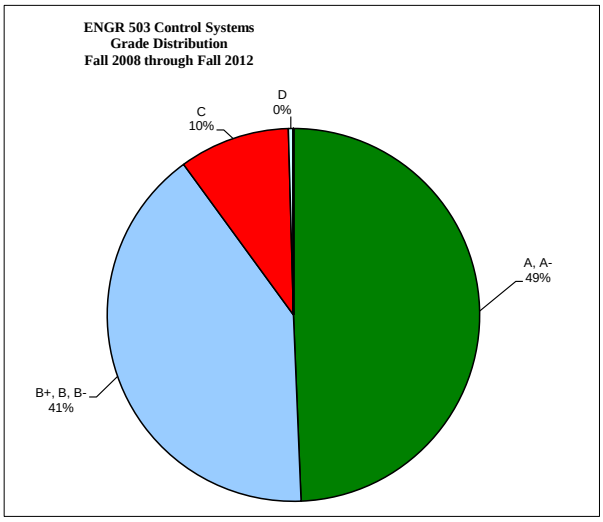
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

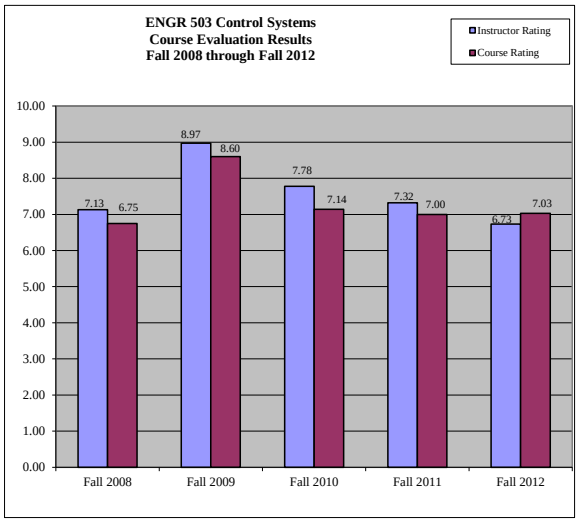
ENGR 503 Control Systems

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Fall 2008	35	3.22	0.50	12	21	2					16	45.71%	7.13	2.16	6.75	2.27
Fall 2009	41	3.46	0.64	22	16	3					35	85.37%	8.97	1.22	8.60	1.46
Fall 2010	49	3.52	0.54	29	18	2					37	75.51%	7.78	1.51	7.14	1.64
Fall 2011	59	3.19	0.71	24	23	12					25	42.37%	7.32	1.82	7.00	1.94
Fall 2012	45	3.44	0.67	26	15	3	1				33	73.33%	6.73	2.83	7.03	2.43





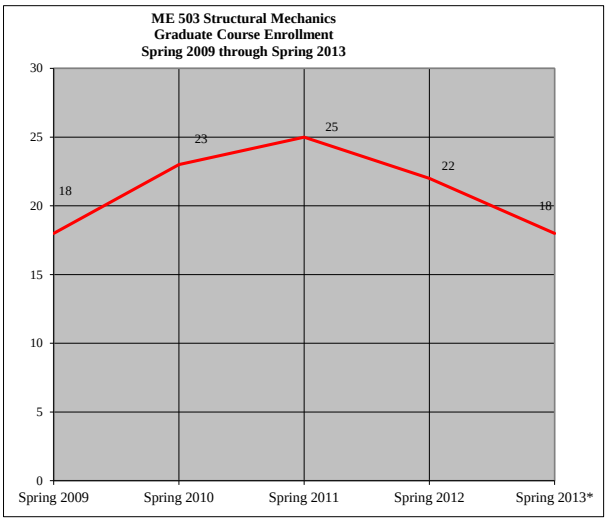


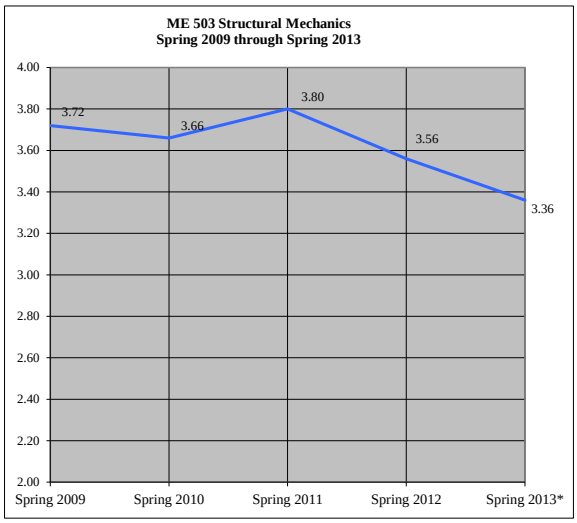


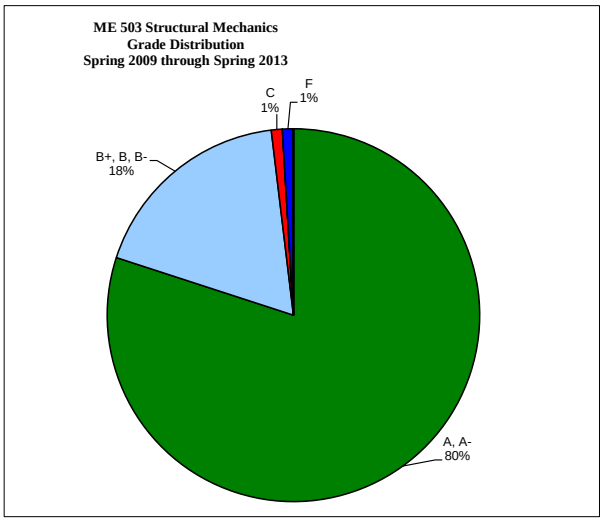
Attachment V: Course summary data for ME 503

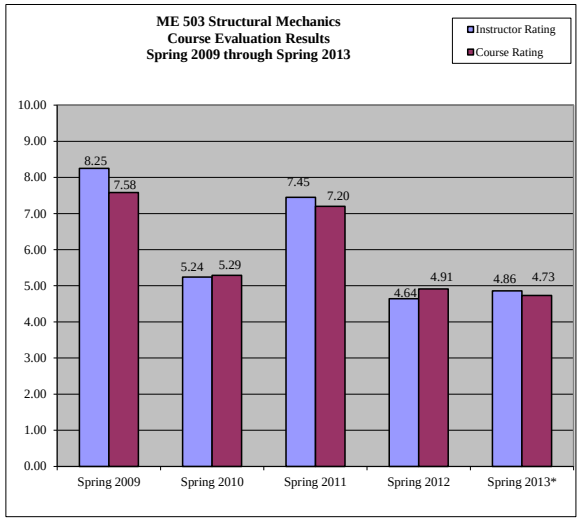
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
ME 503 Structural Mechanics

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	18	3.72	0.34	15	3						12	66.67%	8.25	1.06	7.58	1.78
Spring 2010	23	3.66	0.81	22							17	73.91%	5.24	2.63	5.29	2.59
Spring 2011	25	3.80	0.33	21	4						20	80.00%	7.45	0.57	7.20	2.14
Spring 2012	22	3.56	0.48	15	7						11	50.00%	4.64	3.01	4.91	2.84
Spring 2013*	18	3.36	1.00	11	5	1		1			16	88.89%	4.86	2.11	4.73	2.09









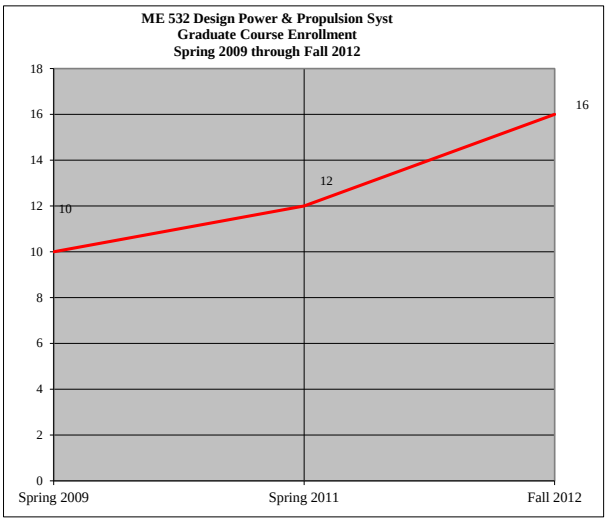
*Spring 2013 was using a new evaluation form where instructor and course ratings were based on a 7-point scale

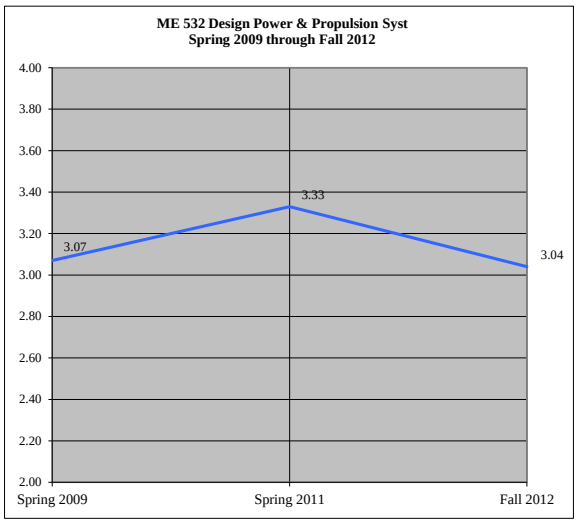
Attachment W: Course summary data for ME 532

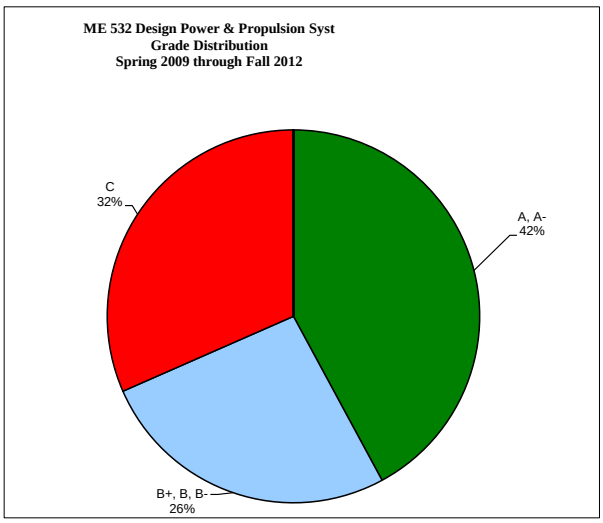
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING

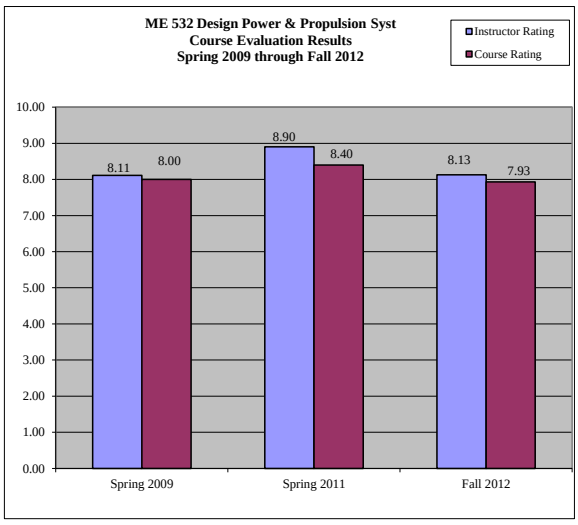
ME 532 Design Power & Propulsion Syst

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I	#	%	Avg.	StDev.	Avg.	StDev.
Spring 2009	10	3.07	0.95	5	1	4					9	90.00%	8.11	1.36	8.00	1.12
Spring 2011	12	3.33	0.66	5	5	2					10	83.33%	8.90	0.99	8.40	1.65
Fall 2012	16	3.04	0.90	6	4	6					15	93.75%	8.13	1.41	7.93	1.39





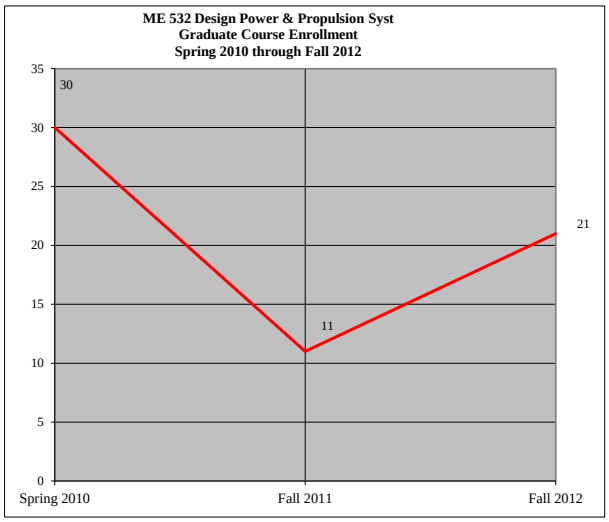


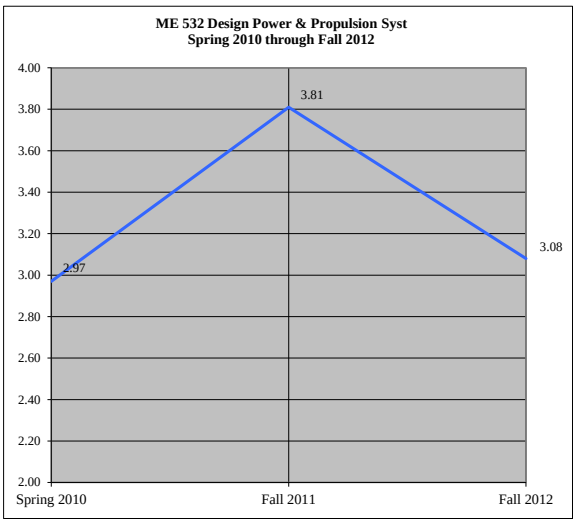


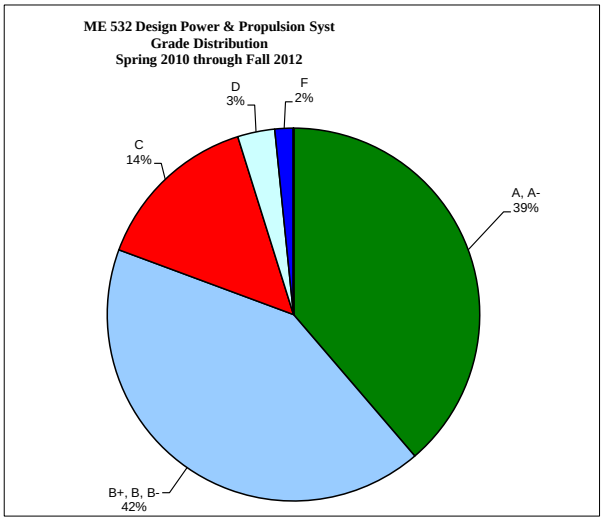
Attachment X: Course summary data for ENGR 552

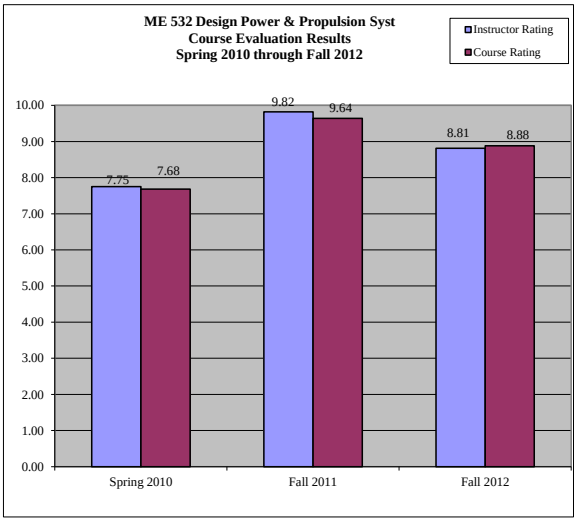
COURSE SUMMARY DATA: SCHOOL OF ENGINEERING
ME 552 Design Power & Propulsion Syst

		Course Grades										Course Evaluation Results					
		Course Grade		Grade Distribution								Course Eval.		Instructor Rating		Course Rating	
Term	Graduate Course Enrollment	Avg.	StDev.	A, A-	B+, B, B-	C	D	F	W	I		#	%	Avg.	StDev.	Avg.	StDev.
Spring 2010	30	2.97	0.90	9	13	6	2					24	80.00%	7.75	1.22	7.68	1.73
Fall 2011	11	3.81	0.33	8	3							11	100.00%	9.82	0.60	9.64	0.67
Fall 2012	21	3.08	0.91	7	10	3		1				16	76.19%	8.81	1.11	8.88	1.26









Appendix B - Milestone Data

Comment on Passage of Comprehensive Exams

GRADUATE COMPREHENSIVE EXAMINATION RESULTS
SCHOOL OF ENGINEERING
DEPARTMENT OF BIOMEDICAL ENGINEERING
AY2008-2009 to AY2012-2013

Master's Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%		0.00%		0.00%		0.00%	**0**
AY2009-2010		0.00%	1	100.00%		0.00%		0.00%	**1**
AY2010-2011		0.00%		0.00%		0.00%		0.00%	**0**
AY2011-2012		0.00%		0.00%		0.00%		0.00%	**0**
AY2012-2013		0.00%		0.00%		0.00%		0.00%	**0**
TOTAL	**0**	**0.00%**	**1**	**100.00%**	**0**	**0.00%**	**0**	**0.00%**	**1**

Doctoral Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%		0.00%		0.00%		0.00%	**0**
AY2009-2010		0.00%	3	100.00%		0.00%		0.00%	**3**
AY2010-2011	1	50.00%	1	50.00%		0.00%		0.00%	**2**
AY2011-2012		0.00%		0.00%		0.00%		0.00%	**0**
AY2012-2013		0.00%	2	100.00%		0.00%		0.00%	**2**
TOTAL	**1**	**0.00%**	**6**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**	**7**

Note:

1) Milestone outcomes were included in the categories High Pass and Pass with Honors if these designations were explicitly indicated in the students' milestone record.

2) Category "High Pass" includes both "High Pass" and "Pass with distinction".

3) The count in this table is based on the exam outcomes of all attempts in an academic year.

4) Level of the comps, i.e. Master's and doctoral, is based on the milestone activities; if there is no specification of the level in the record, students' degree level is used to determine the level.

GRADUATE COMPREHENSIVE EXAMINATION RESULTS
SCHOOL OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
AY2008-2009 to AY2012-2013

Master's Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%		0.00%		0.00%		0.00%	**0**
AY2009-2010		0.00%	1	100.00%		0.00%		0.00%	**1**
AY2010-2011		0.00%		0.00%		0.00%		0.00%	**0**
AY2011-2012		0.00%		0.00%		0.00%		0.00%	**0**
AY2012-2013		0.00%		0.00%		0.00%		0.00%	**0**
TOTAL	**0**	**0.00%**	**1**	**100.00%**	**0**	**0.00%**	**0**	**0.00%**	**1**

Doctoral Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%		0.00%		0.00%		0.00%	**0**
AY2009-2010		0.00%	3	100.00%		0.00%		0.00%	**3**
AY2010-2011	1	50.00%	1	50.00%		0.00%		0.00%	**2**
AY2011-2012		0.00%		0.00%		0.00%		0.00%	**0**
AY2012-2013		0.00%	2	100.00%		0.00%		0.00%	**2**
TOTAL	**1**	**0.00%**	**6**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**	**7**

Note:

1) Milestone outcomes were included in the categories High Pass and Pass with Honors if these designations were explicitly indicated in the students' milestone record.

2) Category "High Pass" includes both "High Pass" and "Pass with distinction".

3) The count in this table is based on the exam outcomes of all attempts in an academic year.

4) Level of the comps, i.e. Master's and doctoral, is based on the milestone activities; if there is no specification of the level in the record, students' degree level is used to determine the level.

GRADUATE COMPREHENSIVE EXAMINATION RESULTS
SCHOOL OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING
AY2008-2009 to AY2012-2013

Master's Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%	1	100.00%		0.00%		0.00%	**1**
AY2009-2010		0.00%	1	100.00%		0.00%		0.00%	**1**
AY2010-2011		0.00%		0.00%		0.00%		0.00%	**0**
AY2011-2012		0.00%		0.00%		0.00%		0.00%	**0**
AY2012-2013		0.00%		0.00%		0.00%		0.00%	**0**
TOTAL	**0**	**0.00%**	**2**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**	**2**

Doctoral Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%	4	100.00%		0.00%		0.00%	**4**
AY2009-2010	1	25.00%	3	75.00%		0.00%		0.00%	**4**
AY2010-2011	1	33.00%	2	67.00%		0.00%		0.00%	**3**
AY2011-2012		0.00%	1	100.00%		0.00%		0.00%	**1**
AY2012-2013		0.00%		0.00%		0.00%		0.00%	**0**
TOTAL	**2**	**0.00%**	**10**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**	**12**

Note:

1) Milestone outcomes were included in the categories High Pass and Pass with Honors if these designations were explicitly indicated in the students' milestone record.

2) Category "High Pass" includes both "High Pass" and "Pass with distinction".

3) The count in this table is based on the exam outcomes of all attempts in an academic year.

4) Level of the comps, i.e. Master's and doctoral, is based on the milestone activities; if there is no specification of the level in the record, students' degree level is used to determine the level.

GRADUATE COMPREHENSIVE EXAMINATION RESULTS
SCHOOL OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
AY2008-2009 to AY2012-2013

Master's Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%		0.00%		0.00%		0.00%	**0**
AY2009-2010		0.00%		0.00%		0.00%		0.00%	**0**
AY2010-2011		0.00%		0.00%		0.00%		0.00%	**0**
AY2011-2012		0.00%		0.00%		0.00%		0.00%	**0**
AY2012-2013		0.00%		0.00%		0.00%		0.00%	**0**
TOTAL	**0**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**	**0**

Doctoral Comprehensive Exam

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2008-2009		0.00%	1	100.00%		0.00%		0.00%	**1**
AY2009-2010		0.00%		0.00%		0.00%		0.00%	**0**
AY2010-2011	1	25.00%	3	75.00%		0.00%		0.00%	**4**
AY2011-2012		0.00%	2	100.00%		0.00%		0.00%	**2**
AY2012-2013		0.00%	2	100.00%		0.00%		0.00%	**2**
TOTAL	**1**	**0.00%**	**8**	**0.00%**	**0**	**0.00%**	**0**	**0.00%**	**9**

Note:

1) Milestone outcomes were included in the categories High Pass and Pass with Honors if these designations were explicitly indicated in the students' milestone record.

2) Category "High Pass" includes both "High Pass" and "Pass with distinction".

3) The count in this table is based on the exam outcomes of all attempts in an academic year.

4) Level of the comps, i.e. Master's and doctoral, is based on the milestone activities; if there is no specification of the level in the record, students' degree level is used to determine the level.

APPENDIX C - Progression Data

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF BIOMEDICAL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Master's Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	7	1	*14.3%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	4	*57.1%*	5	*71.0%*	5	*71.0%*	5	*71.0%*	5	*71.4%*
Fall 2009	7			4	*57.1%*	1	*14.3%*	0	*0.0%*	0	*0.0%*	3	*42.9%*	5	*71.4%*	6	*86.0%*	6	*85.7%*		
Fall 2010	2					0	*0.0%*	0	*0.0%*	0	*0.0%*	1	*50.0%*	1	*50.0%*	1	*50.0%*				
Fall 2011	3							3	*100.0%*	1	*33.3%*	0	*0.0%*	2	*66.7%*						
Fall 2012	11									4	*36.4%*	6	*54.5%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF BIOMEDICAL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Doctoral Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	5	5	*100.0%*	4	*80.0%*	4	*80.0%*	2	*40.0%*	2	*40.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	2	*40.0%*	2	*40.0%*
Fall 2009	5			5	*100.0%*	2	*40.0%*	1	*20.0%*	2	*40.0%*	0	*0.0%*	0	*0.0%*	1	*20.0%*	1	*20.0%*		
Fall 2010	1					1	*100.0%*	1	*100.0%*	1	*100.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*				
Fall 2011	2							2	*100.0%*	1	*50.0%*	0	*0.0%*	0	*0.0%*						
Fall 2012	2									1	*50.0%*	0	*0.0%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Master's Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	2	1	*50.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	1	*50.0%*	2	*100.0%*	2	*100.0%*	2	*100.0%*	2	*100.0%*
Fall 2009	5			3	*60.0%*	2	*40.0%*	1	*20.0%*	1	*20.0%*	1	*20.0%*	2	*40.0%*	3	*60.0%*	3	*60.0%*		
Fall 2010	8					3	*37.5%*	3	*37.5%*	1	*12.5%*	4	*50.0%*	4	*50.0%*	5	*62.5%*				
Fall 2011	3							3	*100.0%*	0	*0.0%*	0	*0.0%*	2	*66.7%*						
Fall 2012	4									3	*75.0%*	1	*25.0%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Doctoral Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	4	3	*75.0%*	3	*75.0%*	3	*75.0%*	1	*25.0%*	1	*25.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	2	*50.0%*	2	*50.0%*
Fall 2009	4			4	*100.0%*	4	*100.0%*	2	*50.0%*	2	*50.0%*	0	*0.0%*	0	*0.0%*	1	*25.0%*	1	*25.0%*		
Fall 2010	0					0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*				
Fall 2011	2							2	*100.0%*	2	*100.0%*	0	*0.0%*	0	*0.0%*						
Fall 2012	7									5	*71.4%*	0	*0.0%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCES
Graduate Cohort Fall 2008 through 2012
Master's Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	0	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*
Fall 2009	1			0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	1	*100.0%*	1	*100.0%*	1	*100.0%*	1	*100.0%*		
Fall 2010	3					2	*66.7%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	2	*67.0%*	2	*66.7%*				
Fall 2011	0							0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*						
Fall 2012	0									0	*0.0%*	0	*0.0%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Master's Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	9	8	*88.9%*	2	*22.2%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	1	*11.1%*	6	*67.0%*	8	*89.0%*	8	*89.0%*	8	*88.9%*
Fall 2009	3			3	*100.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	3	*100.0%*	3	*100.0%*	3	*100.0%*		
Fall 2010	3					2	*66.7%*	1	*33.3%*	0	*0.0%*	1	*33.3%*	2	*67.0%*	3	*100.0%*				
Fall 2011	2							1	*50.0%*	0	*0.0%*	1	*50.0%*	1	*50.0%*						
Fall 2012	16									8	*50.0%*	6	*37.5%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Doctoral Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	3	3	*100.0%*	2	*66.7%*	2	*66.7%*	1	*33.3%*	1	*33.3%*	0	*0.0%*	0	*0.0%*	1	*33.3%*	1	*33.3%*	1	*33.3%*
Fall 2009	7			6	*85.7%*	5	*71.4%*	3	*42.9%*	5	*71.4%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*		
Fall 2010	10					7	*70.0%*	7	*70.0%*	6	*60.0%*	1	*10.0%*	1	*10.0%*	1	*10.0%*				
Fall 2011	4							4	*100.0%*	3	*75.0%*	0	*0.0%*	0	*0.0%*						
Fall 2012	11									7	*63.6%*	0	*0.0%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF ENGINEERING MANAGEMENT
Graduate Cohort Fall 2008 through 2012
Master's Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	21	11	*52.4%*	2	*9.5%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	9	*42.9%*	18	*86.0%*	20	*95.0%*	20	*95.0%*	20	*95.2%*
Fall 2009	14			4	*28.6%*	2	*14.3%*	1	*7.1%*	0	*0.0%*	9	*64.3%*	12	*85.7%*	13	*93.0%*	14	*100.0%*		
Fall 2010	15					11	*73.3%*	0	*0.0%*	0	*0.0%*	4	*26.7%*	15	*100.0%*	15	*100.0%*				
Fall 2011	26							17	*65.4%*	1	*3.8%*	5	*19.2%*	20	*76.9%*						
Fall 2012	12									7	*58.3%*	1	*8.3%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF MATERIALS SCIENCES AND ENGINEERING
Graduate Cohort Fall 2008 through 2012
Master's Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	0	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*
Fall 2009	0			0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*		
Fall 2010	1					1	*100.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	1	*100.0%*	1	*100.0%*				
Fall 2011	1							0	*0.0%*	0	*0.0%*	1	*100.0%*	1	*100.0%*						
Fall 2012	5									4	*80.0%*	1	*20.0%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Master's Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	4	2	*50.0%*	1	*25.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	2	*50.0%*	3	*75.0%*	4	*100.0%*	4	*100.0%*	4	*100.0%*
Fall 2009	6			2	*33.3%*	1	*16.7%*	0	*0.0%*	0	*0.0%*	4	*66.7%*	5	*83.3%*	6	*100.0%*	6	*100.0%*		
Fall 2010	2					2	*100.0%*	1	*50.0%*	0	*0.0%*	0	*0.0%*	1	*50.0%*	2	*100.0%*				
Fall 2011	7							1	*14.3%*	0	*0.0%*	4	*57.1%*	6	*85.7%*						
Fall 2012	8									2	*25.0%*	5	*62.5%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.

GRADUATE PROGRESSION AND GRADUATION
SCHOOL OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
Graduate Cohort Fall 2008 through 2012
Doctoral Program

	Graduate Cohort Size	Returned To CUA in **Fall 2009**		Returned To CUA in **Fall 2010**		Returned To CUA in **Fall 2011**		Returned To CUA in **Fall 2012**		Returned To CUA in **Fall 2013**		Graduated in **One Year**		Graduated in **Two Years***		Graduated in **Three Years***		Graduated in **Four Years***		Graduated in **Five Years***	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Fall 2008	0	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*
Fall 2009	3			3	*100.0%*	3	*100.0%*	3	*100.0%*	2	*66.7%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	1	*33.3%*		
Fall 2010	1					0	*0.0%*	1	*100.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*				
Fall 2011	1							1	*100.0%*	1	*100.0%*	0	*0.0%*	0	*0.0%*						
Fall 2012	2									1	*50.0%*	0	*0.0%*								

*Two to five years of graduation rates are cumulative.

Note: A particular cohort is defined as the combination of the students first enrolled in consecutive sessions of one year: the summer session or the fall semester. For example, cohort 2008 consists of students first enrolled in summer 2008 or fall 2008.