

**ABET
Self-Study Report**

for the

Mechanical Engineering Program

at

The University of Colorado at Colorado Springs

Colorado Springs, CO

30 June, 2011

CONFIDENTIAL

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BACKGROUND INFORMATION

A. Contact Information

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B. Program History

The Bachelor of Science in Mechanical Engineering (ME) degree program at the University of Colorado at Colorado Springs is offered by the Department of Mechanical and Aerospace Engineering (MAE) which is a unit in the College of Engineering and Applied Science (EAS). This program was originally proposed in May of 1997 and adopted in January of 1999 with the establishment of the MAE Department. The last general review took place in 2005, with subsequent visits in 2007 and 2009.

The Program Educational Objectives and Student Outcomes were reformulated following the last general review and an appropriate process of continuous assessment has been put in place and followed since that time.

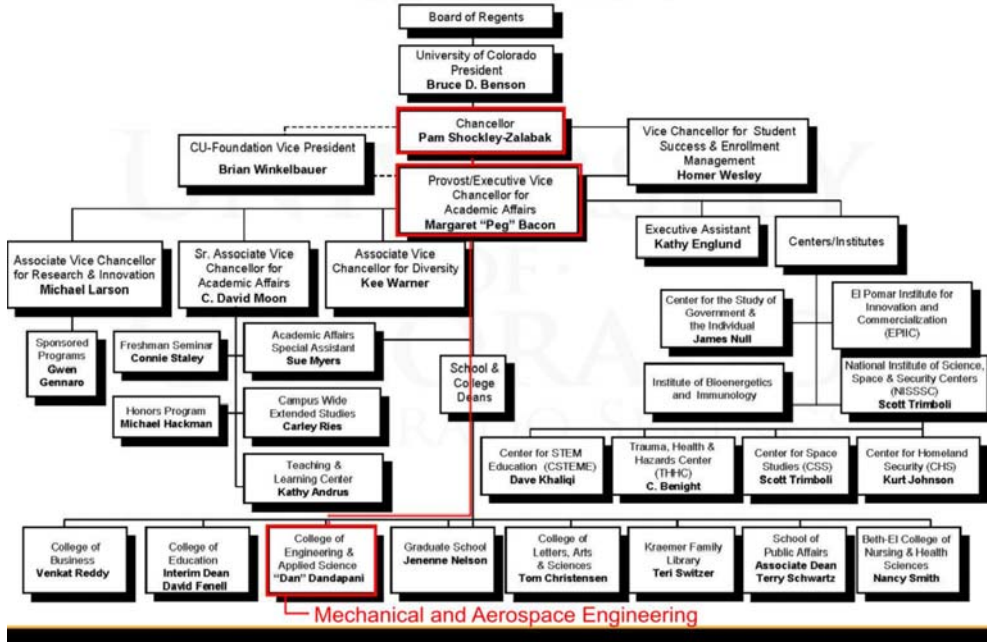
C. Options

There are no options or tracks within the BSME degree program.

D. Organizational Structure

The Mechanical and Aerospace Engineering Department administers the BS in Mechanical Engineering, as well as minors in Mechanical and Aerospace Engineering, a master's degree in Mechanical Engineering, and a Ph.D. degree with an emphasis in Mechanical Engineering. The department chair serves as a coordinator, point-of-contact, and representative of the MAE Faculty. The department is located in the College of Engineering and Applied Science which is administered by the Dean of the college. The Dean reports to the Provost who reports to the Chancellor.

Academic Affairs



E. Program Delivery Modes

The Mechanical Engineering program is delivered in day and evening classes during fall, spring, and summer semesters. The classes are virtually all traditional lecture/laboratory classes. A single web-based Thermodynamics course has been offered during summer semester on two occasions in the past, and introductory freshman classes are regularly offered as interim (week-long, between semester) classes.

F. Program Locations

All portions of the Mechanical Engineering program are offered at the UCSS campus.

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

There were no remaining deficiencies, weaknesses or concerns from the most recent ABET Final Statement (2009 visit).

H. Joint Accreditation

The program is not jointly accredited and is not seeking joint accreditation.

GENERAL CRITERIA

CRITERION 1. STUDENTS

A. Student Admissions

The following are the admission standards for the College of Engineering and Applied Science. Admission to the program is the first step in assuring quality graduates. Entering freshmen must satisfy the following requirements:

4 units of English, 4 units of mathematics, 3 units of natural science including physics and chemistry, 2 units of social science, 2 units of a foreign language, and 1 unit of electives

ranking in the upper 30th percentile of their high school graduating class
composite ACT score of 25 or above **or** composite SAT score of 1120 or above

Students not meeting the above requirements are considered on a case by case basis.

Students who have deficiencies in their background can be admitted to the College of Letters, Arts, and Sciences as Pre-Engineering students. This program is specifically designed for students with math and/or science deficiencies. After completing the appropriate background courses students may initiate a request for acceptance into their selected major.

B. Evaluating Student Performance

Evaluation of student performance in the Department of Mechanical and Aerospace Engineering is carried out at two distinct levels. The first level involves the standard performance measures used in each of the courses in the curriculum (homework, quizzes, exams, projects, presentations, etc.) and the letter grades earned in each course. This level of evaluation is primarily used to measure and monitor student proficiency on a course-by-course basis. The second level of student evaluation in the department involves the formal outcomes-based evaluation and assessment process. The formal feedback-oriented evaluation and assessment processes that have been developed within the department to allow continuous monitoring of the undergraduate program are described in more detail in section 4. This assessment process includes faculty evaluation of student performance through the various forms of student evaluation as well as a review of outcomes connected to each course.

Student progress is monitored via required group advising sessions held prior to registration each semester and through optional meetings with assigned advisors. Mandatory group advising sessions are held for all students in the major where curricular and program information is disseminated and students present a proposed schedule for a quick review by a faculty member and have an opportunity to ask any individual questions. All students are assigned an individual faculty advisor with whom they can meet for more individual or in-depth questions about the curriculum, academic advice, or career advice. The chair of the curriculum committee and the engineering advisor maintain an updated list of student assignments and communicate these in response to student inquiries.

C. Transfer Students and Transfer Courses

Transfer students are considered for admission if they meet the freshman admission criteria, and are in good standing with the school from which they are transferring. Each transfer application to EAS is decided on a case by case basis.

The College policy for transfer credit is as follows:

“After a prospective transfer student has made application and submitted transcripts to UCCS, the Office of Admissions and Records issues a computer-generated student transfer credit evaluation, listing those courses that are acceptable by University standards for transfer. Once a student receives the transfer evaluations, an appointment should be made with the engineering advisor to conduct an evaluation of the transfer credits as applicable to a degree in the College of Engineering and Applied Science.”

Issues related to engineering course content are referred to the MAE faculty for a final decision. Transfer credit from engineering technology programs is not accepted unless evidence is provided showing complete equivalence to the corresponding course in the mechanical engineering program. Petitions for credit or requirement waiver are handled by the department chair on a case-by-case basis.

D. Advising and Career Guidance

Students entering the ME program are initially advised by the College engineering advisor. All entering freshman are required to attend a one-day orientation session in the spring or summer before entering. This orientation session includes mathematics placement tests as necessary, and the students are advised in accordance with the outcome of this test and the major they wish to pursue in the College of Engineering and Applied Science. Transfer students attend a half day orientation session prior to the semester they enter the program. At the orientation session, the students not only meet the engineering advisor but are also introduced to faculty from the college who volunteer to participate in the orientation sessions. An additional College of Engineering and Applied Science orientation is held in the fall.

Following formal admission to the ME program, each student is assigned a full-time faculty member from the MAE department to serve as an advisor. This advisor interacts with students as needed to give advice on curricular and career matters, and to monitor students' progress.

All ME students must be advised every semester before they are allowed to register for classes. This requirement allows the students to meet with a faculty member who will help them understand the different areas in mechanical engineering and select classes accordingly. Two group advising sessions are held each semester prior to the opening of class enrollment. The group advising structure allows information to be communicated to all students uniformly and efficiently. During the group advising sessions, students will meet with, and receive advice and enrollment approval from a full-time faculty member who may or may not be their assigned advisor. Assigned advisors are available throughout the semester for consultation on course selection or other professional issues.

E. Work in Lieu of Courses

There is no credit provided for work in lieu of courses for military experience, life experience, etc. Advanced Placement courses are handled as transfer courses.

F. Graduation Requirements

In addition to the continuous monitoring built into the semester-by-semester advising process, all students meet with the engineering advisor for a pre-graduation check during their second-to-last semester. Then, the engineering advisor performs a final graduation check following each student's last semester. If there are any deficiencies, the student must make them up before graduating. All graduating students must have both an overall grade point average of 2.0 and an average grade point average of 2.0 in all MAE courses attempted.

Also, as a graduation requirement, the department chair meets individually with each graduating senior for an exit interview. This interview is used to solicit feedback from the students on all aspects of the program and of their undergraduate experience and to provide an opportunity for final advising on career, graduate school, or other plans. The senior exit interview is part of the assessment process for the mechanical engineering program.

The degree awarded is a Bachelor of Science in Mechanical Engineering.

G. Transcripts of Recent Graduates

Official student transcripts will be provided separately. The figure below provides explanations for a single semester for items on the transcript that may not be otherwise obvious. There are no program options for the undergraduate degree in mechanical engineering. The major is designated as shown.

COURSE TITLE	CRSE NR	UNITS	GRADE	PNTS
Fall 2007 UC Colo Springs				
Coll Engr & Applied Sci UGRD		Mechanical Engineering		
Intro Vis Basic Non-Majors	C S 107	3.0	A	12.0
Tech Writ & Presentation	ENGL 309	3.0	B-	8.1
Calculus II	MATH 136	4.0	A-	14.8
General Physics I - Calc Based	PES 111	(4.0)	W	0.0
Adv Physics Lab I - Calc Based	PES 116	(1.0)	W	0.0
ATT 15.0		EARNED 10.0	GPAHRS 10.0	GPAPTS 34.90
GPA 3.490				

courses
 major during the semester reported
 credit hours
 credit hours attempted for the semester
 credit hours completed for the semester
 credit hours used to calculate GPA
 grade point average

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

Vision Statement

The University of Colorado at Colorado Springs will provide unsurpassed, student-centered teaching and learning, and outstanding research and creative work that serve our community, state, and nation, and result in our recognition as the premier comprehensive, regional research university in the United States.

Mission Statement

The Colorado Springs campus of the University of Colorado shall be a comprehensive baccalaureate university with selective admission standards. The Colorado Springs campus shall offer liberal arts and sciences, business, engineering, health sciences, and teacher preparation undergraduate degree programs, and a selected number of masters and doctoral degree programs.

B. Program Educational Objectives

The Mechanical Engineering Program Educational Objectives are as follows:

- (1) Graduates will be able to use mechanical engineering principles, proficiencies, and technical information to pursue graduate school or engineering careers including but not limited to design, development, project management and technical sales.
- (2) Graduates will be equipped to pursue continued lifelong growth and development in mechanical engineering including learning and applying new engineering processes, tools, and technologies.
- (3) Graduates will be able to contribute to the state-of-the-art in engineering design, research and problem solving including consideration of professional responsibilities.

These Program Educational Objectives are accessible to the general public from the departmental web page: >About>Objectives & Outcomes.

The URL for this web page is:

<http://www.eas.uccs.edu/mae/objectives.shtml>

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

These objectives are consistent with the mission of the College of Engineering and Applied Sciences, and with the mission of the University of Colorado at Colorado Springs. The college mission statement is given below, with the most relevant paragraphs from the department program educational objectives identified by number in parentheses after each paragraph of the mission statement.

In partnership with the community and our alumni, the mission of the College of Engineering and Applied Science is to:

Illuminate: Inspiring a passion in our students for life-long learning; and graduating engineers and scientists who are knowledgeable and competitive in the global marketplace throughout their careers; (1,2,3)

Investigate: Conducting recognized and relevant research that has both local and global impact; and (2,3)

Innovate: Engaging in leadership, service, economic and technology development that improves health, welfare, and prosperity through engineering. (1,3)

The campus vision and mission statements are provided above in part 2A. The MAE program educational objectives are well aligned with the campus vision and mission statements. The graduation of excellent mechanical engineers prepared for graduate school either here or elsewhere or for immediate entry into the work force directly addresses the UCCS mission statement. The preparation of graduates for lifelong growth and state-of-the-art contributions to the profession similarly address the UCCS vision statement.

D. Program Constituencies

Significant constituencies for the mechanical engineering degree program include students, program graduates, employers of program graduates, and other academic institutions. The MAE Advisory Board has representatives from employers, community businesses, and academia. This committee typically meets once per year, and provides valuable ongoing review of the Program Educational Objectives. All three of the Program Educational Objectives directly address the needs of students and program graduates in preparing them for a successful engineering career with the capacity to continue to grow and to contribute positively in their chosen career path. Objectives (1) and (2) most directly address the needs of engineering employers. Engineers who have achieved these objectives will be productive and valuable employees. Other academic institutions benefit most directly from objectives (1) and (3) since a significant number of program graduates proceed to graduate schools and should be prepared to succeed in graduate school as well as perform state-of-the-art research there.

E. Process for Revision of the Program Educational Objectives

After their initial development, review and refinement, the current Program Educational Objectives were formally adopted by the department late in the fall of 2006, and have been reviewed annually since that time. Through this year, no changes in the Program Educational Objectives have been deemed appropriate.

The main vehicle for review is an annual meeting between the MAE Faculty and the MAE Advisory Board. In this meeting the faculty provide an update on department activities, plans, and structure. This includes a discussion and review of the Program Educational Objectives and Student Outcomes. The Board has representatives from several constituencies of the department including community leaders, engineering employers, and educators. They provided useful feedback in the development of the current Program Educational Objectives, and continue to review them annually.

CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

The Student Outcomes adopted for the mechanical engineering program are the outcomes specified by ABET in Criterion 3 for all engineering programs with the addition of two additional requirements specifically for mechanical engineering. These Student Outcomes are:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- (l) an ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
- (m) preparation to work professionally in both thermal and mechanical systems areas

These Student Outcomes are accessible to the general public from the departmental web page: >About>Objectives & Outcomes.

The URL for this web page is:

<http://www.eas.uccs.edu/mae/objectives.shtml>

B. Relationship of Student Outcomes to Program Educational Objectives

Table 3-1 delineates the correspondence between the Student Outcomes and the Program Educational Objectives developed by the MAE department. This mapping correlates each outcome with one or more Program Educational Objectives for which it is most germane and which will ultimately lead to achievement of that particular objective. While there is certainly considerable overlap, and grounds to argue for wider assignments, it was felt that this description provided a compromise between overly broad and excessively narrow mappings, both of which would be less useful.

Table 3-1 – Correlation Between Educational Objectives and Outcomes

<p style="text-align: center;">Program Educational Objectives</p> <p style="text-align: center;">Student Outcomes</p>	<p>Graduates will be able to use mechanical engineering principles, proficiencies, and technical information to pursue graduate school or engineering careers including but not limited to design, development, project management and technical sales.</p>	<p>Graduates will be equipped to pursue continued lifelong growth and development in mechanical engineering including learning and applying new engineering processes, tools, and technologies.</p>	<p>Graduates will be able to contribute to the state-of-the-art in engineering design, research and problem solving including consideration of professional responsibilities.</p>
a) an ability to apply knowledge of mathematics, science, and engineering	X		
b) an ability to design and conduct experiments, as well as to analyze and interpret data	X	X	
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	X	X	X
d) an ability to function on multi-disciplinary teams	X	X	X
e) an ability to identify, formulate, and solve engineering problems	X	X	X
f) an understanding of professional and ethical responsibility	X	X	X
g) an ability to communicate effectively	X	X	X
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	X	X	X
i) a recognition of the need for, and an ability to engage in life-long learning		X	
j) a knowledge of contemporary issues	X	X	X
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	X		
l) an ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes	X		
m) preparation to work professionally in both thermal and mechanical systems areas	X	X	

CRITERION 4. CONTINUOUS IMPROVEMENT

A. Program Educational Objectives

Assessment Process and Results

The main components of the assessment and review plan for the Program Educational Objectives are detailed in Table 4-1.

Source	frequency	tool	feedback and implementation
advisory board	1 year	discussion and review	faculty meeting review
students	fall, spring	quantitative survey--expectations	chair report to faculty--faculty review
students	fall, spring	exit interview qualitative discussion	faculty meeting review
alumni--4yrs out	1 year	quantitative survey	faculty meeting review

The departmental advisory board includes representatives from employers of program graduates, community businesses, and academia. The current makeup of the advisory board, including professional affiliations is included in Appendix E. The advisory board was consulted extensively in the original formulation and review of the departmental Program Educational Objectives in 2006. The consensus in formal and informal consultation with the board in the years since the establishment of these Program Educational Objectives is that they remain appropriate as formulated, and a comprehensive in-depth review should not be undertaken for several more years unless specific problems are identified. Several board members expressed concerns that too frequent changes in long-term objectives could be counter-productive to achievement of the objectives.

Current student feedback about Program Educational Objectives is collected from graduating seniors in the spring and fall of every year in both qualitative and quantitative forms. While Program Educational Objectives are long-term career and professional objectives, we feel that graduating students can provide useful feedback on their perception of how well the program has prepared them to achieve these objectives. Appendix F contains data collected from these senior exit surveys and interviews. Appendix F-1 is the survey completed by all graduating seniors in their last semester. Following the survey, results from Spring 2007 through Spring 2011, are included as appendices F-2 through F-10. For each semester, the qualitative summary of discussions prepared by the department chair is first, followed by the quantitative survey results presented in graphs. Both of these are distributed to the faculty near the end of the semester in which the interviews are completed. Finally, for each semester report, notes are included from the faculty discussion of the summary and quantitative results. This discussion typically takes place in the first faculty meeting of the subsequent semester.

Alumni surveys to evaluate achievement of Program Educational Objectives were sent every year beginning with 2007-08 academic year. The survey instrument itself is included as Appendix G-1. It is followed by graphs of the quantitative results of the survey in Appendix G-2.

B. Student Outcomes

Assessment Process and Results

The main components of the assessment program for Student Outcomes are listed in Table 4-2.

Table 4-2. Student Outcomes Assessment Summary			
Source	frequency	tool	feedback and implementation
faculty	fall, spring	qualitative and quantitative course assessment	assessment meeting
students	fall, spring	quantitative survey	chair report to faculty—faculty review
students	fall, spring	exit interview qualitative discussion	faculty meeting review
alumni—4yrs out	1 year	quantitative survey RE: retrospective on selves	faculty meeting review

The primary assessment vehicle for Student Outcomes is the assessment meeting held every semester by the faculty. For this assessment meeting, each faculty member prepares a course assessment following a PowerPoint template for presentation to the rest of the faculty. The course assessment reviews the catalog description, place in the curriculum (pre-requisites and courses for which it is pre-requisite), and course outcomes. The relationship between the course outcomes and the department outcomes is also reviewed. A detailed assessment of how specific course components contribute to course and department outcomes is presented, and problems and/or improvements are identified. Both quantitative (student grades and performance) and qualitative (student feedback, faculty perception) information are included in consideration of course results. An assessment on every required undergraduate course is completed every academic year. The faculty gather for an assessment meeting early in each semester to assess the courses from the previous semester. The faculty member who prepared the assessments presents the PowerPoint presentation to the rest of the faculty, and open discussion follows. Discussion includes, but is not limited to, specific problems in the class, problems propagating to or from the class, appropriateness of class evaluation mechanisms, and appropriateness of the course in addressing of Student Outcomes. Appendix H contains materials pertaining to the course assessment process. Appendix H-1 shows the mapping between required undergraduate courses and Student Outcomes. In order to give perspectives across both time and courses, Appendix H-2 contains assessment presentations for a single course (MAE 3310 Heat and Mass Transfer) for four years. These are followed in Appendix H-3 by sample course assessment presentations for four courses (MAE 1502, MAE 2103, MAE 3310, and MAE 4120) from a single semester (Fall 2010, Spring 2010 assessment meeting). Finally, faculty notes from some of the course assessment meetings are included as Appendix H-4.

The exit interview quantitative survey and qualitative discussion is used for assessment of Student Outcomes as well as Program Educational Objectives. Appendix F contains the survey instrument, the department chair summaries, the quantitative results, and the summaries of faculty discussion as described previously with respect to the Program Education Objectives. While for the Program Educational Objectives the survey and qualitative discussions relate to graduates' expectations for long-term career effects, in the case of Student Outcomes, the survey questions and associated discussion directly assess the graduating students' experience with the program. Since these students are just completing the full program, they have a direct, firsthand, and comprehensive perspective on the completion of Student Outcomes.

The annual alumni survey is also used to assess Student Outcomes. The survey and results are presented in Appendix G as described previously for Program Educational Objectives. For the Student Outcomes, the alumni survey questions ask the alumni to consider their preparation in retrospect at the time of graduation. While this approach has the limitation that it relies on memories that may not be fresh, it has the benefit of the intervening time and work experience to put a different perspective on the degree and quality of the achievement of the Student Outcomes at the time of graduation. These surveys serve as a long-term perspective on the program and the full benefits of the process will only be realized over periods of several years.

C. Continuous Improvement

Program Improvements From Assessment Processes

In the four years in which the new Program Educational Objectives and new Student Outcomes with their associated assessment processes described above have been in place, we have made significant changes to the program that can be directly attributed to the assessment process. Each of these substantive changes represents a significant improvement to the undergraduate program and together they demonstrate that the assessment processes are working as intended. Numerous other small changes have been made in naming, course coordination, honoraria coordination, outcomes assignments, prerequisite structure, etc. These changes are helpful in cleaning up the assessment process, in helping the department run smoothly, and in addressing student concerns, but do not represent significant improvements to the curriculum. Nevertheless, taken together they constitute another benefit of the assessment process in place.

- (1) Change in name and content of Statics (MAE 2101) and Dynamics (MAE 2102) to Engineering Mechanics I (MAE 2103) and Engineering Mechanics II (MAE 2104).

This change was made as a result of course assessment meetings where potential improvements in the balance of content between these two introductory mechanics courses were identified. Following extensive consideration and discussion in the course assessment meetings, faculty meetings, and by the departmental curriculum committee, the name and content changes were approved and implemented.

- (2) Change in required programming class.

This change came about primarily as a result of qualitative and quantitative feedback in exit interviews. It was also supported by discussions in course assessment meetings. For some time students had been unhappy with their preparation for completing upper division course

assignments in MATLAB. Qualitative exit interview feedback indicated that they felt that too much time had elapsed since their introductory programming classes, and that they had no specific training in MATLAB syntax. This was indicated as a primary element in the relatively low quantitative survey results for Program Outcome (k) “an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice”. This feedback was supported by the course assessment meetings where some faculty indicated that students initially seemed poorly prepared for completing MATLAB assignments. As a result of this information, the MAE faculty proposed approaching the computer science department about offering a new service course to provide introductory programming instruction in a MATLAB environment. This proposal was accepted and the new course, CS 1090, has been developed and incorporated into the curriculum.

(3) Change in structure of laboratory classes.

This change came from course assessment meetings, senior exit interview feedback and faculty initiative. In senior exit interviews, students had indicated a disconnect between their laboratory courses and their academic courses and a strong desire to have more “hands-on” work in their academic curriculum. This contributed to relatively low survey results on Student Outcomes (b) “an ability to design and conduct experiments, as well as analyze and interpret data” and (c) “an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability”. Course assessment presentations for the laboratory course sequence supported this information. A faculty member proposed restructuring the thermal-fluids laboratories to be incorporated into the heat transfer and fluids classes in order to address these concerns. The proposal was discussed and accepted by the faculty, and is in the process of being implemented into the curriculum.

(4) Shop component added to MAE 1503

This change was also in response to course assessment meetings and senior exit interview feedback. As indicated above, students indicated a desire for more “hands-on” work, and returned low survey ratings on Student Outcomes (b) and (c). In course assessment meeting discussion, it was determined that adding a shop component to the introductory engineering course could help address these issues. The change has been made and has proven very popular with the students who have been affected.

(5) Introduction of MAE 2200 Materials Engineering

This change was made partly in response to institutional changes—the materials science class that has been offered by the Chemistry Department is slated to end at some point—and partly in response to student feedback in senior exit interviews, senior exit surveys, and informal conversations with faculty. The change was discussed in faculty and assessment meetings, an appropriate instructor was identified to develop the course, and the course was offered as an option beginning in Fall 2010. Eventually, it will replace Chemistry 3010 in the curriculum as a required course.

(6) Emphasis on improving communications in several classes

Additional formal emphasis in strengthening student communications skills has been instituted in several courses with particular attention in MAE 1503 Introduction to Engineering Design, and MAE 3130 Fluid Mechanics. Some faculty (Webb and Albertson) have participated in Writing-across-the-Curriculum, and other programs to introduce improved communications skills into the curriculum. The need for improvement was identified in the quantitative results of the senior exit surveys, in discussions surrounding the course assessment meetings, and as a perennial concern of employers.

(7) Change in Senior Exit Survey wording

This relatively minor change was made as a result of faculty discussion of the Senior Exit Survey results. Potential misinterpretation of the intent of the evaluation of Student Outcomes was identified as a possible source of skewing in the results, and a wording change was instituted to clarify the intent.

(8) Change in Student Outcomes

This change was made in response to a suggestion from the MAE Advisory Board at the Fall 2009 meeting and was considered in faculty meetings and finally implemented in Fall 2010.

D. Additional Information

Additional information supporting this section is located in the appendices including exit interview and exit survey results and review for Program Educational Objectives and Student Outcomes (appendix F), alumni survey results for Program Educational Objectives and Student Outcomes (appendix G) and course assessment meeting materials for Student Outcomes (appendix H).

CRITERION 5. CURRICULUM

A. Program Curriculum

Table 5-1 Curriculum
Mechanical and Aerospace Engineering

Course (Department, Number, Title) List all courses in the program by term starting with first term of first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE. ²	Curricular Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered ¹
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (✓)	General Education	Other		
MATH 1350 Calculus I	R	4				S11, F10	54
PES 1110 General Physics I	R	4				S11, F10	80
MAE 1502 Principles of Engineering	R		3			S11, F10	20
ENGL 1310 Writing & Rhetoric I	R			3		S11, F10	20
Humanities/Social Science Elective	SE			3		S11, F10	NA
MATH 1360 Calculus II	R	4				S11, F10	55
PES 1120 General Physics II	R	4				S11, F10	71
MAE 1503 – Introduction to Engineering Design	R		2			S11, F10	23
CHEM 1030 General Chemistry I	R	5				S11, F10	101
MATH 2350 Calculus III – 4	R	4				S11, F10	37
MAE 2103 Engineering Mechanics I – 3	R		3			S11, F10	43
CHEM 3010 Materials Science – 3 OR MAE 2200 Materials Engineering	SE		3			S11, F10	27
C S 1090 Introduction to Programming in MATLAB – 3	R	3				S11, F10	32

MAE 2055 Mechetronics I – 3	R		3			S11, F10	21
MATH 3400 Introduction to Differential Equations – 3	R	3				S11, F10	38
MAE 3055 Mechetronics II – 3	R		3			S11, F10	18
MAE 2301 Engineering Thermodynamics I – 3	R		3			S11, F10	46
MAE 2104 Engineering Mechanics II – 3	R		3			S11, F10	35
MATH 3810 Probability & Statistics OR ECE 3610 Engineering Probability & Statistics – 3	SE	3				S11, F10	58
MAE 3302 Engineering Thermodynamics II – 3	R		3	√		S11, F10	36
MAE 3401 Modeling and Simulation Dynamic Systems - 3	R		3			S11, F10	24
ENGL 2090 Technical Writing & Presentation – 3	R				3	S11, F10	20
MAE 3201 Strength of Materials – 3	R		3			S11, F10	34
MATH 3130 Introduction to Linear Algebra – 3	R	3				S11, F10	42
MAE 3005 Engineering Measurement Lab – 3	R		3			S11, F10	19
MAE 3130 Fluid Mechanics – 3	R		3			S11, F10	17
MAE 3131 Fluid Mechanics Lab – 1	R		1			S11, F10	17
MAE 4421 Automatic Control of Aero/Mech systems – 3	R		3			S11, F10	26
MAE 3501 Machine Design I – 3	R		3			S11, F10	25
Technical Elective Course – 3	SE		3			S11, F10	NA
Humanities/Social Science elective – 3	SE				3	S11, F10	NA
MAE 4120 Machine Design II - 3	R		3	√		S11, F10	27
MAE 4402 Intermediate Dynamics – 3	R		3			S11, F10	24
MAE 3310 Heat and Mass Transfer – 3	R		3			S11, F10	34
MAE 3311 Heat and Mass Transfer Lab - 1	R		1			S11, F10	34
MAE 4510 Engineering Design I – 1	R		1	√		F10, F09	50
Technical Elective Course – 3	SE		3			S11, F10	NA
Business Elective – 3	SE				3	S11, F10	NA
MAE 4511 Engineering Design II – 3	R		3	√		S11, S10	49
Technical Elective Course – 3	SE		3			S11, F10	NA
Technical Elective Course – 3	SE		3			S11, F10	NA
Business Elective – 3	SE				3	S11, F10	NA
Humanities/Social Science elective – 3	SE				3	S11, F10	NA

TOTALS-ABET BASIC-LEVEL REQUIREMENTS		<i>37 hours</i>	<i>71 hours</i>	<i>21 hours</i>			
OVERALL TOTAL CREDIT HOURS FOR THE DEGREE		<i>129 hours</i>					
PERCENT OF TOTAL		<i>29%</i>	<i>55%</i>	<i>16%</i>			
Total must satisfy either credit hours or percentage	Minimum Semester Credit Hours	32 hours	48 hours				
	Minimum Percentage	25%	37.5 %				

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

Text colors in table 5-1 are used to delineate between semesters in the suggested curriculum. The pre-requisite structure is visible in figure 5-1, below. The box colors in figure 5-1 signify general areas of the curriculum and are unrelated to the text color in table 5-1.

Curriculum Alignment with Program Educational Objectives

The curriculum delineated above aligns with the Program Educational Objectives in multiple ways. Table 5-2 breaks down the entire curriculum into six broad areas: (1) basic math and science, (2) engineering science, (3) engineering design, application, and laboratory, (4) humanities/social sciences/communication, (5) technical electives and (6) business electives. Each of these broad areas maps into the Program Educational Objectives as summarized in Table 5-2. All segments of the curriculum are important to PEO (1) which addresses an engineering career including engineering practice or graduate school. For PEO (2), which treats continued life-long growth and learning, it is assumed that the majority of further growth will build upon the foundations of the advanced classes in engineering, humanities or social sciences, and business. The third PEO, relevant to state-of-the-art practice, advanced technologies, and discovery of new knowledge is addressed primarily by the advanced engineering courses.

Overall, the curriculum supports and aligns with all three Program Educational Objectives and provides a strong basis for the achievement of all three.

Table 5-2. Curriculum Alignment with Program Educational Objectives

	(1) Graduates will be able to use mechanical engineering principles, proficiencies, and technical information to pursue graduate school or engineering careers including but not limited to design, development, project management and technical sales.	(2) Graduates will be equipped to pursue continued lifelong growth and development in mechanical engineering including learning and applying new engineering processes, tools, and technologies.	(3) Graduates will be able to contribute to the state-of-the-art in engineering design, research and problem solving including consideration of professional responsibilities.
basic math and science	x		
math, physics, chemistry, etc.			
engineering science	x	x	x
statics, thermodynamics, int. dynamics, fluid mechanics, etc.			
engineering design, application, laboratory	x	x	x
mechatronics, thermodynamics II, senior design, etc.			
humanities/social sciences/communication	x	x	
technical electives	x	x	x
business electives	x	x	

Curriculum and Prerequisite Structure Support for the Attainment Student Outcomes

Appendix H-1 provides a table with a complete mapping between individual required MAE courses and Student Outcomes. While this table assures that all Student Outcomes are addressed in some way by MAE courses, it should be acknowledged that additional support for outcomes (f)-(j) is undoubtedly provided by the humanities and social science electives, by the required writing classes, and by the business electives just as the technical electives provide additional support for technically-related Student Outcomes. All Student Outcomes are addressed by multiple required MAE courses. In addition, many Student Outcomes are addressed in less focused ways by additional courses that are not noted in the mapping. For example, Student Outcome (d) dealing with functioning on interdisciplinary teams is supported by group and team projects in multiple classes and laboratories, though it is not a primary focus of those classes and the interdisciplinary aspect is not emphasized.

The prerequisite structure of the curriculum, clearly visible in Figure 5-1, enables an orderly progression of technical skills and abilities as well as an increasingly complete achievement of Student Outcomes. For example, Student Outcome (e) which deals with the ability to identify, formulate and solve engineering problems is addressed in a very rudimentary and somewhat qualitative way in the freshman engineering courses. As students progress through the required math and science courses and into the engineering science and practice courses they acquire additional skills tools and are exposed to increasingly difficult problems. By the time that they have completed the senior level engineering science courses and the capstone design class, they are prepared to achieve this Student Outcome as practicing engineers.

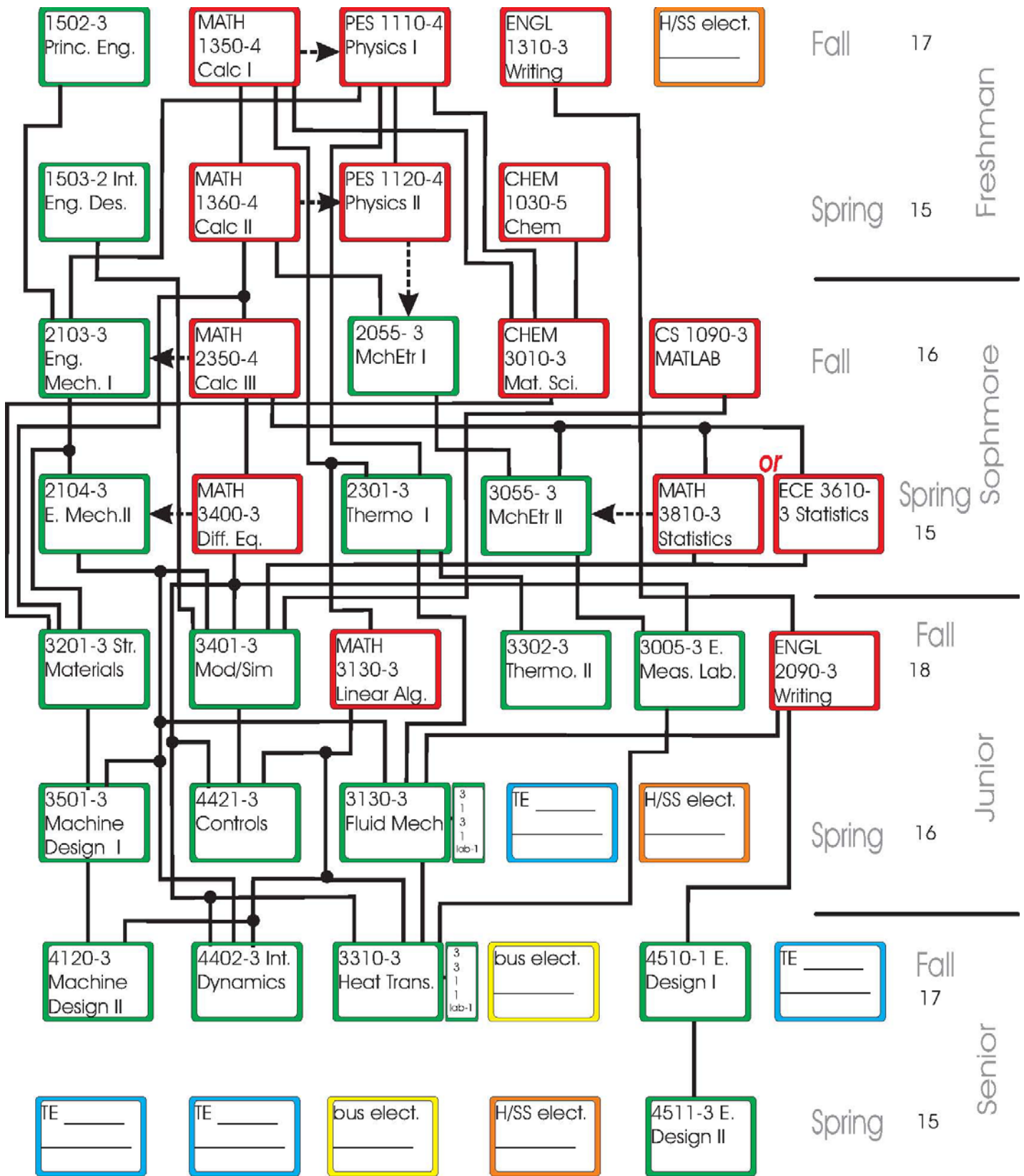


Figure 5-1. Flow Chart of Sample Curriculum Showing Prerequisite Structure

Curricular Area Satisfaction

The program fulfillment of the three curricular areas delineated in Table 5-1 are summarized below in table 5-3:

Table 5-3 Curricular Areas

	Math & Basic Sciences	Engineering Topics	General Education
MAE curriculum	<i>37 hours</i>	<i>71 hours</i>	<i>21 hours</i>
percentage	<i>29%</i>	<i>55%</i>	<i>16%</i>
Min. Semester Credit Hours	32 hours	48 hours	
Minimum Percentage	25%	37.5 %	

The requirements for both math and sciences and for engineering topics are exceeded by the curriculum in terms of semester credit hours as well as percentages of the total curriculum.

The necessary depth of study is clearly indicated by the prerequisite structure illustrated in Figure 5-1. For example, in the area of mathematics, both Differential Equations and Statistics require MATH 1350, 1360, and 2350 as prerequisites. PES 1120 requires PES 1110 as a prerequisite, and CHEM 3010 requires CHEM 1030, PES 1110, and MATH 1350 as prerequisites. In the area of engineering topics, Intermediate Dynamics, a senior level course, requires all of the aforementioned math sequence up through Differential Equations, as well as Engineering Mechanics I and II (Statics and Dynamics) and Linear Algebra. Another senior level course, Heat Transfer, requires the laboratory sequence of Mechatronics I & II and Engineering Measurements Lab, the math sequence up through Differential Equations, and Linear Algebra, and Fluid Mechanics.

Major Design Experience

The capstone design classes consist of the sequence of MAE 4510 and MAE 4511 which are to be taken in the last full year of study. This two-course sequence provides students with a real-world engineering design experience prior to graduation. Design projects are provided by local companies, military, non-profit, and commercial organizations, and individuals. The project sponsor also supplies a technical point of contact for the student design team as well as any needed materials or supplies. In the fall semester, the students are introduced to the projects by a representative of the project sponsor, divided into teams and each team is connected to a project through a first-choice, second-choice, etc., bid system. Also in the fall semester, students are taught formal design procedures, and are introduced to standards, practices and design approaches. Background and preliminary work on the assigned design project is also started late in the fall semester. The class continues in the spring semester as MAE 4511 with the design teams working independently, and also having regular progress reviews with the faculty instructor and with the project sponsor. Several formal intermediate design reviews are conducted culminating with a complete project presentation close to the end of the spring semester.

The senior design sequence has a strong emphasis on working together productively in teams, interfacing with a customer, and delivering a professional engineering design product. Students typically use technical background from throughout the curriculum and many students report that their senior design experience was the highlight of their time in the program.

Cooperative Education

The mechanical engineering curriculum at UCCS does not allow any cooperative education credit to count toward the curriculum.

Materials for Review

At the time of the visit, course materials including a syllabus, textbook, and three samples of student work for each assignment, quiz, and examination, will be available for review for each required MAE class in the curriculum.

B. Course Syllabi

Course syllabi are located in Appendix A.

CRITERION 6. FACULTY

A. Faculty Qualifications

The faculty in the Department of Mechanical and Aerospace Engineering consists of 10 full-time members and approximately 10 part-time adjunct members. The full-time faculty consists of 8 tenure track positions and two instructor positions. All of the tenure track faculty and instructors hold a PhD in Mechanical or Aerospace Engineering and the adjunct faculty must hold a Master's degree or higher in engineering or closely related field. The expertise of the full-time faculty spans all of the areas of mechanical and aerospace engineering including thermodynamics, fluid mechanics, heat transfer, dynamics, controls, and solid mechanics. Through the use of adjunct faculty, the department is able to keep class sizes generally at 35 students or fewer, a characteristic of the program that is highly beneficial for the students.

All permanent faculty members have numerous research publications in their area of expertise and many have extensive industrial experience. The tenure track faculty have robust research programs that make use of both undergraduate and graduate research assistants. This keeps faculty current in the practices and state-of-the-art in their area and also provides excellent experience for the students. Faculty have had recent sponsored research projects with numerous local and national industry and government partners including AFRL, Spectranetics, Missile Defense Agency, Colorado Institute of Technology, and others. Nontenure track faculty generally come from the local industry or the U.S. Air Force Academy and have many years experience in their field.

Full-time Faculty	Expertise
Dr. Julie Albertson	experimental aerodynamics, engineering education
Dr. Michael Calvisi	theoretical and computational fluid dynamics
Dr. Peter Gorder	dynamic system modeling and control
Dr. Andrew Ketsdever	gas dynamics, propulsion
Dr. Michael Larson	solid mechanics, design, materials
Dr. Ken Lauderbaugh	manufacturing processes, modeling and control
Dr. Valmiki Sooklal	solid mechanics, finite element modeling
Dr. James Stevens	thermodynamics, heat transfer
Dr. Steve Tragesser	dynamics, spaceflight mechanics
Dr. Rebecca Webb	fluid mechanics, heat transfer

B. Faculty Workload

The College of Engineering and Applied Science at UCCS has a flexible workload policy. Faculty are all expected to be engaged in teaching, research and service activities, but they can choose from a teaching intensive, normal, or research intensive load. A normal teaching load is five classes per academic year, which is expected to require approximately half of the faculty member's time. The remaining workload is normally distributed as 30% research and 20% service. For research, faculty are expected to publish in technical journals, attend and present at conferences, obtain research grants, obtain patents and/or engage with industry activities. Because of the relatively small size of the full-time faculty, the service and committee loads on the department members are significant. Most faculty are members of several committees. Faculty also participate in academic advising, student mentoring, club advising (including ASME, AIAA, SWE, NASA Space Grant), and professional service. All of the full-time faculty have all of their time dedicated to departmental activities (other than university service), except for Professor Larson who currently has campus assignments and is only quarter-time in the department.

C. Faculty Size

The size of the faculty is adequate to deliver the mechanical engineering curriculum with reasonable section sizes. As enrollments have grown, permanent faculty positions have been regularly allocated to the department.

All faculty are involved with students in a variety of ways beyond classroom teaching. As mentioned above, faculty serve as advisors to a variety of student clubs and extracurricular organizations. Several faculty are heavily engaged with undergraduates participating in research. Five of seven Undergraduate Research Scholarships awarded by the EAS College in the first year of the program (AY 2010-11) came to the MAE department. Students from the MAE department participate extensively in the campus Undergraduate Research Journal, and a full volume was recently dedicated to research from the MAE department.

The entire permanent faculty are involved with student advising. Group advising sessions for class registration take place in the latter half of each semester. In addition, each student is assigned a permanent faculty member for advising and counseling on academic and/or professional matters. Faculty members also participate broadly in campus and college activities related to student recruitment and retention including advising at freshman orientation meetings, participating in freshman welcome meetings and college showcase events, and many other activities.

Students and faculty interact with a wide spectrum of local industries and employers through the senior design class. Most of the senior design projects are sponsored by local companies which provide an engineering liaison who works with the student group throughout the year-long design project. Local sponsoring companies for the senior design class in AY 2010-11 included NAVSYS Corporation, Racing Cows, Inc., Aqua Reborn, Qualtek, Agilent Technologies, Concealfab, USAFA Center for Aircraft Structural Life Extension, Bechtel Corporation, Cheyenne Mountain Air Force Station, and Goodrich Aircraft Interior Products.

D. Professional Development

All permanent faculty members have numerous research publications in their area of expertise and many have extensive industrial experience. The range of the faculty expertise covers thermal and fluid sciences, solid mechanics, dynamics and controls, aerodynamics,

spacecraft mechanics and propulsion. The faculty also have expertise in experimental, numerical, and analytical approaches to research problems. This breadth is sufficient for coverage of all of the courses in the undergraduate curriculum and allows for competent supervision and coordination when part-time faculty members teach courses.

In addition, all permanent faculty members have teaching experience, and most have multiple years of teaching experience at multiple universities. Most part-time instructors have extensive teaching experience as well. All permanent faculty have Ph.D. degrees from different major universities. All of the faculty are intimately involved in the delivery of the undergraduate mechanical engineering program, and all are deeply committed to building an excellent program.

E. Authority and Responsibility of Faculty

The faculty of the MAE Department have complete control and responsibility for the curriculum and as well as for all process associated with evaluation, assessment and improvement of the program. Development and review of the Program Educational Objectives and Student Outcomes are conducted by the faculty with input from all of the constituencies described in the section on Criterion 2 Program Education Objectives. All faculty participate in guidance of the program and decisions about the curriculum through monthly (during the academic year) faculty meetings, assessment meetings (each semester), and participation on various departmental committees.

The dean and provost provide overall direction for the EAS College and UCCS campus, respectively, and insure that departmental program and curricular decisions are in keeping with campus and system policies and guidelines. The dean is assisted by a college curriculum committee which reviews all curricular changes proposed by individual departments.

The authority and responsibility of the faculty is derived from two sources: the department bylaws and the rules of the regents. Essentially, these include all matters of the department, curriculum and programs administered by the department. Germane sections of these sources are included below:

MAE Department Bylaws

I. THE FACULTY

- 1. Department Faculty: The department faculty consists of all tenured and tenure-track faculty, plus instructors and senior instructors with appointments in the department.*
- 2. Voting Members of the Faculty: The voting members of the faculty will, with some exceptions as noted in later sections, consist of those individuals holding tenured or tenure-track faculty appointments of at least half time in the Department. Instructors and senior instructors can be given voting rights by a majority vote of existing voting members of the faculty.*
- 3. Powers: The voting members of the Departmental faculty shall have jurisdiction over all matters that concern the Department, within the rules of the Regents, the policies of the University, and the rules of the College. This includes, but is not limited to, the curricula for the programs*

administered by the Department, program degree requirements, student admissions; and departmental organizational structure.

Board of Regents Laws

4.A.4 Faculty Membership

There shall be a faculty of each college or school which shall consist of all general faculty members. The voting membership of a college or school faculty shall be determined by its faculty.

4.A.5 Faculty Powers

(A) A College or school faculty shall collaborate with the dean in the governance of the college or school as to all matters that concern only the college or school in question.

PART B: DEPARTMENTS

4.B.1 Organization

(A) A department of a college or school shall be an academic unit organized around a single academic discipline or several related academic disciplines.

(B) To establish a department, a proposal must be approved by the appropriate dean and chancellor, the president, and shall be subject to the approval of the Board of Regents.

(C) Departments shall develop their working structure, and department rules, subject to the approval of the dean and chancellor and in accordance with policies established by the board.

Table 6-1. Faculty Qualifications

Name of Program

Faculty Name	Highest Degree Earned- Field and Year	Rank ¹	Type of Academic Appointment ² T TT NTT FT or PT ⁴	Years of Experience			Professional Registration/ Certification	Level of Activity H, M, or L			
				Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry	
Julie Albertson	PhD., Mechanical Engineering, 1992	I	NTT	FT	5	19	8	EIT (FE)	M	M	L
Michael Calvisi	Ph.D. Applied Science and Technology, 2006	AST	TT	FT	8	1	1	P.E.	M	M	L
Peter Gorder	Ph.D. Mechanical Engineering, 1993	ASC	T	FT	5	18	11		M	M	L
Andrew Ketsdever	Ph.D. Aerospace Engineering, 1995	ASC	T	FT	16	7	3		M	M	L
Michael Larson	Ph.D. Mechanical Engineering, 1992	P	T	FT	8	21	5		M	M	L
Ken Lauderbaugh	Ph.D. Mechanical Engineering, 1985	ASC	T	FT	7	21	10		M	M	L

Valmiki Sooklal	Ph.D Mechanical Engineering, 2007	I	NTT	FT	4	3.5	2.5		L	M	L
James Stevens	Ph.D. Mechanical Engineering, 1991	P	T	FT	0.5	19	8	P.E.	M	M	L
Steven Tragesser	Ph.D., Aerospace Engineering, 1997	ASC	T	FT	1.5	11	6		M	M	L
Rebecca Webb	Ph.D., Mechanical Engineering, 2005	AST	TT	FT	3.5	6	4		L	M	L
Jason Clifford	Master of Engineering, 2007	A	NTT	PT	4	3.5	3.5		L	H	L
Russ Cummings	Ph.D., Aerospace Engineering, 1988	A	NTT	PT	10	24	5		H	H	L
Robert Gist	Masters, Aerospace Engineering, 1991	A	NTT	PT	11	8	8		L	M	L
Jesse McClure	M.S., Mechanical Engineering, 2005	O	NTT	PT	1	5	4		L	M	H
Gary Reynolds	M.S.M.E., 1979	A	NTT	PT	29	2	3	P.E.	H	M	L
Lianne Miller	MS, Mechanical Engineering 2006	A	NTT	PT	4	0.5	0.5		L	M	M
Fred Porter	MSEE, AFIT 1973	A	NTT	PT	50	30	4	P.E.	L	M	M
Tim Scully	D. Comp Sci 1998	A	NTT	PT	35	25	10		M	M	L

	MSEE, 1990										
Jim Torley	Masters, Aerospace Engineering 1998	A	NTT	PT	45	20	11		L	M	H
Kyle Webb	MSEE, Electrical Engineering, 2005	A	NTT	PT	11	1.5	1.5	-	L	L	L

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

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other
2. Code: TT = Tenure Track T = Tenured NTT = Non Tenure Track
3. The level of activity, high, medium or low, should reflect an average over the year prior to the visit plus the two previous years.
4. At the institution

Table 6-2. Faculty Workload Summary

Name of Program

Faculty Member (name)	PT or FT ¹	Classes Taught (Course No./Credit Hrs.) Term and Year ²	Program Activity Distribution ³			% of Time Devoted to the Program ⁵
			Teaching	Research or Scholarship	Other ⁴	
Julie Albertson	FT	MAE 1502 (3hr) (4 sections) Fall 2010 MAE 1503 (2hr) Fall 2010 MAE 3310 (3hr) Fall 2010 ID 101 (3hr) Fall 2010 MAE 1503 (2hr) Winterim 2011 MAE 1502 (3hr) Spring 2011 MAE 1503 (2hr) (3 sections) Spring 2011 MAE 3130 (3hr) Spring 2011 MAE 3320 (3hr) Spring 2011 MAE 3040 (3hr) Summer 2011 MAE 3310 (3hr) Summer 2011 MAE 3311 (1hr) Summer 2011	80%	5%	15%	90%
Michael Calvisi	FT	MAE 3201 (3hr) Fall 2010 MAE 4402 (3 hr) Spring 2011	20%	60%	20%	100%
Peter Gorder	FT	MAE 3401 (3hr) Fall 2010 MAE 4510 (1hr) Fall 2010 MAE 5011 (3hr) Fall 2010 MAE 4421 (3hr) Spring 2011 MAE 4511 (3hr) Spring 2011	60%	20%	20%	100%

		MAE 5012 (3hr) Spring 2011				
Andrew Ketsdever	FT	MAE 2301 (3 hr) Fall 2010 MAE 5140 (3 hr) Fall 2010 MAE 5391 (3 hr) Spring 2011	30%	50%	20%	100%
Michael Larson	FT	MAE 5201 (3hr) Spring 2011	40%	40%	20%	25%
Ken Lauderbaugh	FT	MAE 4120 (3 hr) Fall 2010 MAE 4421 (3 hr) Fall 2010 MAE 5417 (3 hr) Spring 2011 MAE 3401 (3 hr) Spring 2011	40%	40%	20%	100%
Valmiki Sooklal	FT	MAE3005 (3hr) Fall2010, Spring 2011 MAE3501(3hr) Fall2010, Spring 2011 MAE4402(3hr) Fall2010, Spring 2011 MAE1502 (3hr) Fall2010, Spring 2011	80%	0%	20%	100%
James Stevens	FT	MAE 5310 (3hr) Fall 10 MAE 2301 (3hr) Spring 11	20%	30%	50%	100%
Tragesser	FT	MAE 2103 (3hr) Fall 2010 MAE 5424 (3hr) Fall 2010 MAE 2104 (3hr) Spring 2011 MAE 5125 (3hr) Spring 2011	50%	30%	20%	100%
Rebecca Webb	FT	MAE 3130 (3 hr) Fall 2010 MAE 4130 (3 hr) Fall 2010 MAE 3310 (3 hr) Spring 2011 MAE 5131 (3 hr) Spring 2011	40%	40%	20%	100%
Jason Clifford	PT	MAE 1502 (3hr) Fall 2010 MAE 1503 (2hr) Spring 2010	100%	0%	0%	100%
Russell Cummings	PT	MAE 4135 (3hr) Fall 2010 MAE 4415 (3 hr) Spring 2011	100%	0%	0%	100%
Robert Gist	PT	MAE 2103 (3hr) Spring 2011 MAE 2104 (3hr) Fall 2010	100%	0%	0%	100%

Jesse McClure	PT	MAE 2200 (3 hr) Fall 2010 MAE 2200 (3 hr) Spring 2011 MAE 4120 (3 hr) Spring 2011	100%	0%	0%	100%
Gary Reynolds	PT	MAE 9110 (3 hr) Spring 2011	100%	0%	0%	10%
Lianne Miller	PT	MAE3302 (3hr) Fall 2010 MAE 3302 (3 hr) Spring 2011 MAE 3201 (3 hr) Spring 2011	100%	0%	0%	100%
Fred Porter	PT	MAE 3055 (3 hr) Fall 2010 MAE 2055 (3 hr) Spring 2011	100%	0%	0%	100%
Tim Scully	PT	MAE 3055 (3hr) Fall 2010 MAE 2055 (3hr) Spring 2011	100%	0%	0%	100%
Jim Torley	PT	MAE 5410 (3 hr) Fall 2010 MAE 4410 (3 hr) Spring 2011	100%	0%	0%	100%
Kyle Webb	PT	MAE 2055 (3hr) Fall 2010, Spring 2011	100	0%	0%	100%

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution
2. For the academic year for which the self-study is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."
5. Out of the total time employed at the institution.

CRITERION 7. FACILITIES

A. Offices, Classrooms and Laboratories

The Department of Mechanical and Aerospace Engineering is housed in the new Science and Engineering Building. The entire building was designed to promote and enhance student learning. Each faculty office is equipped with a minimum of two chairs for student meetings. In addition, the majority of the offices also have meeting tables for the same purpose. A student help center housed by the department also helps to create an atmosphere conducive to learning while simultaneously encouraging two of program outcomes: an ability to function on multi-disciplinary teams and an ability to communicate effectively. The help center can seat twenty-one students, has three large work tables, three additional desks, each equipped with a computer, and copies of many course texts available.

Program classes are typically taught in the Science and Engineering building. Each classroom in this building has a smart podium in addition to the standard white boards. The smart podium is a completely integrated system composed of a computer, DVD player, document camera, sound system, and projector. Having such a system available allows lectures to be significantly enhanced, when applicable, with multimedia presentations or demonstrations of related software.

The department has a variety of teaching laboratories used to provide the students with hands on experience that compliments the theory covered in lectures. Having students work in groups on projects designed to meet this goal addresses a variety of the desired student outcomes. In addition, many of our research labs support undergraduate researchers, providing an unparalleled opportunity to apply classroom learning to meaningful projects.

Materials Lab

- Location: SENG216
- Courses supported: MAE2200
- Equipment:
 - Smart podium
 - Instron machine
 - Rockwell hardness tester
 - Heat treating ovens
 - Polishing wheels
 - Data acquisition systems
- Comments: Each piece of equipment in this classroom is used to provide hands on experience with the theory covered in MAE2200 lectures.
- Outcomes:
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data

 - (g) An ability to communicate effectively.

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

Fluids Lab

- Location: SENG218
- Courses supported: MAE1502, MAE1503, MAE3131, MAE3311
- Equipment:
 - 18 computers
 - Fluids experiments:
 - Hydraulic bench
 - Bernoulli apparatus
 - Flow in pipes test system
 - Centrifugal fan
 - Heat transfer experiments:
 - Linear conduction apparatus
 - Heat transfer in extended surfaces device
 - Transient conduction set-up
- Software: please see Computer Lab software list, additionally computers in this lab have Armfield data acquisition software installed
- Comments: Fluids and heat transfer lab equipment used to provide students with hands on experience with the theory covered in lecture
- Outcomes:
 - (a)** An ability to apply knowledge of mathematics, science, and engineering.
 - (c)** An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
 - (e)** An ability to identify, formulate, and solve engineering problems.
 - (f)** An understanding of professional and ethical responsibility.
 - (h)** The broad education necessary to understand the impact of engineering
 - (g)** An ability to communicate effectively.
 - (h)** The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
 - (j)** A knowledge of contemporary issues.
 - (k)** An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
 - (m)** Preparation to work professionally in both thermal and mechanical systems areas

Instrumentation Lab

- Location: SENG306
- Courses supported: MAE2055, MAE3005, MAE3055
- Equipment:
 - 10 computers
 - 10 workstations
 - Oscilloscope
 - Multimeter

- Soldering iron
 - Hot plate
 - Circuit board
 - Electrical components
- Software: please see Computer Lab software list
- Comments: Test and measurement equipment used to provide students with hands on experience with the theory covered in the lectures given in MAE2055, 3005, and 3055
- Outcomes:
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data
 - (d) An ability to function on multi-disciplinary teams
 - (e) An ability to identify, formulate, and solve engineering problems
 - (g) An ability to communicate effectively
 - (j) A knowledge of contemporary issues
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Wind tunnel lab

- Location: SENG302
- Courses supported: MAE3130, MAE4130
- Equipment:
 - Low speed wind tunnel
 - NACA 0012 and 4412 airfoils
 - Dynamometer
 - Cylinder model with pressure tap
 - Pressure transducer
 - Control/Readout device
- Comments: Equipment used to demonstrate flow separation concepts covered in class.
- Outcomes:
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Computer Lab

- Location: SENG208
- Courses supported: All mechanical engineering
- Equipment:
 - Fully equipped smart podium
 - 20 computers
- Software:
 - Adobe Design premium
 - Advanced Design System

- Ansoft
- Autodesk
- COMSOL 4.1
- Cygwin
- iTunes
- MATLAB
- Mentor Graphics
- Microsoft Office, Silverlight, and Visual Basic
- Modelsim SE
- National Instruments Labview
- NetBeans
- Notepad++
- PowerWorld
- Precision Synthesis
- Questasim
- QuickTime
- SharePoint
- Wolfram Mathematica
- Xilinx ISE Design Suite
- Comments: This lab is often used by faculty to provide MATLAB, Inventor, and COMSOL help sessions.
- Outcomes:
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

B. Computing Resources

Computing facilities are ample to support the scholarly and professional activities of the students and faculty. All EAS College computing facilities are open to all students and faculty.

Details of the EAS College computing facilities including hardware and software are presented below:

Datacenter: 40 kW UPS w/auto switch to backup generator for long-term power outages.

- VMware Infrastructure
 - 2 x HP Procurve w/redundant 10 GbE uplinks to campus routing core.
 - 2 x HP Procurve redundant 24 port 10GbE server edge switches
 - VMware vCenter – Dell 2950
 - VMware vSphere 4.x - 2 x Dell PowerEdge R810, 384GB RAM
 - 2 x Dell PowerEdge R710, 48GB RAM 12TB NAS storage
- HP DL180's - additional 20TB redundant/distributed NAS storage
- 2 x Windows Remote Desktop Servers (24/7 remote access for students) w/software as EN233.

Wireless access is available in most buildings on campus.

EN138 (Software Dev. Lab): 27 x Dell Optiplex 990, Intel Core i7-2600 CPU @ 3.40 GHz, 8GB RAM, 465GB HDD, 64-bit Windows 7, 1 GbE

Sunday – Thursday: 8:00am - 12:00am

Friday: 8:00am – 5:00pm

Saturday: 12:00pm – 5:00pm

ActiveState - ActivePerl Build 1204 [294330]	Microsoft Corporation - Internet Explorer Version
ADA	9.00.8112.16421
Adobe CS4 Service Manager Version 4.0.1	Microsoft Corporation - Office Source Engine Version
Adobe Reader Version 10.0.1.434	14.0.4730.1010
Alias - Maya Thu 07/20/2006, 200607200010	Microsoft Corporation - Silverlight Plug-In Version
Alice	4.0.60310.0
Apple Inc. - Bonjour Version 2.0.5.0	Microsoft Lync 2010 Version 4.0.7577.275
Apple Inc. - iTunes Version 10.2.2.14	Microsoft Office 2010 Version 14.0.5130.5003
Apple Inc. - QuickTime QuickTime 7.6.9 (1680.9)	Microsoft OneNote Version 14.0.5128.5000
Blender Version 2.57	Microsoft Outlook Version 14.0.4760.1000
Don HO - Notepad++ Version 5.9	Microsoft XNA Game Studio 4.0 Version 4.0.20823.0
dotPDN LLC - Paint.NET Version 3.58.4081.24586	Microsoft® .NET Framework Version 4.0.31106.0
DrRacket	Microsoft® DirectX for Windows® Version 9.29.1962.0
Epic Games, Inc. - UDK Game Version 1, 0, 8364, 0	Microsoft® Games for Windows® - LIVE Version
Epic Games, Inc. - UDK Mobile Game Version 1, 0, 8364, 0	3.5.0050.0
Epic Games, Inc. - UDKLift Version 1.0.3911.19448	Microsoft® Windows® Operating System Version
Epic Games, Inc. - UnrealEngine3 Version	12.0.7600.16385
1.0.4142.22186	Mozilla Corporation - Firefox Version 4.0.1
FlashDevelop 3.2.2 RTM for Microsoft.NET 2.0 Runtime	Mozilla, Linspire Inc. - Nvu Personal Debug
Version 3.0.0.0	MzScheme
Ghostscript 9.02	NUnit Version 2.5.10.11092
GNU Visual Debugger	OpenOffice.org 3.3 Version 3.03.9556
GRacket	openwatcom.org - Open Watcom Version 1.90
GSview 4.9	PLT Scheme Version 4, 2, 5, 0
jGRASP	Prolog
jGRASP Startup Settings	Python Interactive Shell
Larus-Stone pcspim Version 8, 0, 0, 0	Racket
LATS	RealNetworks, Inc. - RealPlayer (32-bit) Version
Microsoft (R) Visual Studio (R) 2010 Version	12.0.1.652
10.0.30319.1	SlowAndSteadyAlice
Microsoft Corporation - .NET Compact Framework	SSH Secure Shell Version 3.2.9
Version 3.7	Sun Microsystems, Inc. - Java(TM) Platform SE 6 U25
	Version 6.0.250.6
	The MathWorks Inc. - MATLAB Version 7.12.0.384
	TightVNC Win32 Viewer Version 1.5.3.0
	Vim Version 7, 2, 269, 0
	VMware Converter Hosted Version 3.0.3 build-132753
	VMware vCenter Converter Standalone Version 4.0.1
	build-161434
	VMware Workstation Version 6.5.4 build-246459
	VMware, Inc. - vSphere Client Version 4.1.0.12319
	YoYo Games Ltd - Game Maker Version 8.1

EN233 (Computational Lab) - 35 x Dell Optiplex 780, Intel Core 2 Quad CPU Q9550 @ 28.83GHz, 4GB RAM, 300GB HDD, 64-bit Windows 7, 1 GbE

Sunday – Thursday: 8:00am - 12:00am
Friday: 8:00am – 5:00pm
Saturday: 12:00pm – 5:00pm

(Classkit License) COMSOL Multiphysics 4.1
Acesso Software Inc. - FLEXnet Publisher (32 bit)
Version 11.7.0.0 build 76260
AdaGide
Adobe Reader Version 10.0.0.407
Advanced Micro Devices Inc. - Catalyst Control Centre
Version 2.0.0.0
Alexander Roshal - WinRAR archiver Version 3.71.0.0
Apple Inc. - Bonjour Version 2.0.4.0
Apple Inc. - iTunes Version 10.1.1.4
Apple Inc. - QuickTime QuickTime 7.6.9 (1680.9)
Autodesk - AutoCAD Version 18.1.49.0.0
Autodesk Design Assistant 2011 Version 15, 0, 0, 1
Autodesk DWF Application Version 11.0.0.86
Autodesk Inventor Project Editor 2011 Version 14, 0, 0, 1
Autodesk Moldflow Inventor Tool Suite Integration 2011
Job Manager
Autodesk, Inc. - AutoCAD Mechanical Version 2011
Autodesk, Inc. AddInMgr Version 1, 0, 0, 1
Autodesk, Inc. FEAFFilesHandler Autodesk Inventor 2011
Blender
CACE Technologies, Inc. - WinPcap Version 4.1.0.1753
COMSOL 4.1 with MATLAB
Dept. of Civil & Mechanical Engineering, USMA -
WPBD2010 Version 12.00.0005
Digilent Inc. - Adept Application Version 2.4.2
Don HO - Notepad++ Version 5.86
dotPDN LLC - Paint.NET Version 3.56.3972.42626
EAGLE 5.10.0
FlashDevelop 3.3.2 RTM for Microsoft.NET 2.0 Runtime
(R1574) Version 3.0.0.0
GNU Visual Debugger
IDLE (Python GUI)
jGRASP
JoCar Consulting - Bricx Command Center Version 3.3
Launch NX session
LEGO MINDSTORMS NXT Version 2.0
Licensing Wizard
LTspice IV Version 4.08o
Macrovision Corporation - LMTOOLS Utility Version
10, 8, 5, 0
MDSolids Version 3.05
Mentor Graphics - PCLS_OK MFC Application Version
2, 0, 0, 0
Mentor Graphics Corporation - Precision Synthesis
Version 2010a_Update1.228
Microsoft (R) Visual Studio (R) 2010 Version
10.0.30319.1
Microsoft Corporation - .NET Compact Framework
Version 3.5
Microsoft Corporation - Internet Explorer Version
9.00.8112.16421
Microsoft Corporation - Silverlight Plug-In Version
4.0.60310.0
Microsoft FxCop 1.36 Version 9.0.30729.17
Microsoft Lync 2010 Version 4.0.7577.0
Microsoft Malware Protection Version 3.0.8107.0
Microsoft Office 2010 Version 14.0.5130.5003
Microsoft Office InfoPath Version 14.0.4763.1000
Microsoft OneNote Version 14.0.4763.1000
Microsoft Outlook Version 14.0.4760.1000
Microsoft XNA Game Studio 3.1 Version 3.1.10527.0
Microsoft® .NET Framework Version 4.0.31106.0
Microsoft® DirectX for Windows® Version 9.28.1886.0
Microsoft® Games for Windows® - LIVE Version
3.4.0054.0
Microsoft® Windows® Operating System Version
12.0.7600.16385
MicroVision Development, Inc. - Express Labeler
Version 1.0
Model Technology - QuestaSim Version 5, 2, 2, 0
ModelSim EE/NT Version 5, 2, 2, 0
Mozilla Corporation - Firefox Version 3.6.13
openwatcom.org - Open Watcom Version 1.80
Parallax, Inc. - BASIC Stamp Editor Version 2.4
PLT Scheme Inc. - Racket Version 5, 0, 2, 0
PreEmptive Solutions, LLC - Dotfuscator Community
Edition Version 5.0.2300.0
Process Design GmbH - Named-Server for LLWin
Version 1, 0, 0, 5
Prolog
ProSign GmbH - Lucky Logik für Windows Version
1.0.0.0
Python (command line)
Racket
RealNetworks, Inc. - RealPlayer (32-bit) Version
12.0.1.609
RecordNow Version 7.0.0
ROBO Pro graphical programming language Version
2,1,3,14
SSH Secure Shell Version 3.2.9
Sun Microsystems, Inc. - Java(TM) Platform SE 6 U23
Version 6.0.230.5
The MathWorks Inc. - MATLAB Version 7.11.0.584
the VideoLAN Team - VLC media player Version 1,1,5,0
TightVNC Win32 Viewer Version 1.5.2.0
VMware Converter Hosted Version 3.0.3 build-132753
VMware vCenter Converter Standalone Version 4.0.1
build-161434
VMware Workstation Version 6.5.4 build-246459
VMware, Inc. - vSphere Client Version 4.1.0.12319

Wolfram Research, Inc. - Mathematica Kernel Version 7, 0, 17, 34024
Wolfram Research, Inc. - Mathematica Version 7, 0, 17, 34023
Xilinx Bash shell
Xilinx Software Development Kit
YoYo Games Ltd - Game Maker Version 8.0

SENG 208 (MAE Lab) - 21 x HP DC7700, Intel Core 2 Quad CPU @ 2.33 GHz, 4GB RAM, 160GB HDD, 64-bit Windows 7, 1 GbE
Sunday – Thursday: 8:00am - 12:00am
Friday: 8:00am – 5:00pm
Saturday: 12:00pm – 5:00pm

(Classkit License) COMSOL Multiphysics 4.1
Acesso Software Inc. - FLEXnet Publisher (32 bit) Version 11.7.0.0 build 76260
AdaGide
Adobe Reader Version 10.0.0.407
Alexander Roshal - WinRAR archiver Version 3.71.0.0
Apple Inc. - Bonjour Version 2.0.4.0
Apple Inc. - iTunes Version 10.1.1.4
Apple Inc. - QuickTime QuickTime 7.6.9 (1680.9)
Autodesk - AutoCAD Version 18.1.49.0.0
Autodesk Design Assistant 2011 Version 15, 0, 0, 1
Autodesk DWF Application Version 11.0.0.86
Autodesk Inventor Project Editor 2011 Version 14, 0, 0, 1
Autodesk Moldflow Inventor Tool Suite Integration 2011 Job Manager
Autodesk, Inc. - AutoCAD Mechanical Version 2011
Autodesk, Inc. - DWG TrueView R18.1.49.0.0
Autodesk, Inc. AddInMgr Version 1, 0, 0, 1
Autodesk, Inc. FEAFFilesHandler Autodesk Inventor 2011
Autodesk, Inc. MSP Autodesk Inventor 2011
Autodesk, Inc. TaskScheduler Autodesk Inventor 2011
Autodesk® Inventor® 2011 Autodesk® Inventor® 2011
Blender
CACE Technologies, Inc. - WinPcap Version 4.1.0.1753
COMSOL 4.1 with MATLAB
Dept. of Civil & Mechanical Engineering, USMA - WPBD2010 Version 12.00.0005
Diligent Inc. - Adept Application Version 2.4.2
Don HO Notepad++ Version 5.86
dotPDN LLC - Paint.NET Version 3.56.3972.42626
EAGLE 5.10.0
Equitrac Express Version 4.1.1.3567
Equitrac Platform Component Version 4.1.1.3567
FlashDevelop.org - ASDocGen Version 1.0.0.0
GNU Visual Debugger
IDLE (Python GUI)
Indigo Rose Corporation - Setup Factory 6.0 Runtime Module Version 6.0.0.2
Microsoft Corporation - Internet Explorer Version 8.00.7600.16385
Microsoft Corporation - Silverlight Plug-In Version 4.0.60310.0
Microsoft Corporation - Windows® Search Version 7.00.7600.16385
Microsoft Lync 2010 Version 4.0.7577.275
Microsoft Office 2010 Version 14.0.5130.5003
Microsoft Office InfoPath Version 14.0.4763.1000
Microsoft OneNote Version 14.0.4763.1000
Microsoft Outlook Version 14.0.4760.1000
Microsoft XNA Game Studio 3.1 Version 3.1.10527.0
Microsoft® .NET Framework Version 4.0.31106.0
Microsoft® DirectX for Windows® Version 9.28.1886.0
Microsoft® Games for Windows® - LIVE Version 3.4.0054.0
Microsoft® Windows® Operating System Version 12.0.7600.16385
MicroVision Development, Inc. - Express Labeler Version 2.1
MindVision Software - Installer VISE Version 3.1.1
Model Technology - QuestaSim Version 5, 2, 2, 0
ModelSim EE/NT Version 5, 2, 2, 0
Mozilla Corporation - Firefox Version 3.6.13
openwatcom.org - Open Watcom Version 1.80
Parallax, Inc. - BASIC Stamp Editor Version 2.4
PLT Scheme Inc. - Racket Version 5, 0, 2, 0
PreEmptive Solutions, LLC - Dotfuscator Community Edition Version 5.0.2300.0
Prolog
ProSign GmbH - Lucky Logik für Windows Version 1.0.0.0
Python (command line)
Racket
RealNetworks, Inc. - RealPlayer (32-bit) Version 12.0.0.879
ROBO Pro graphical programming language Version 2,1,3,14

INTEST Application Version 1, 0, 0, 1	SPACE.com, Canada, Inc. - Starry Night Version 3.1.2
jGRASP	SRS Premium Sound Version 1.10.1.0
jGRASP Startup Settings	SSH Secure Shell Version 3.2.9
JoCar Consulting - Bricx Command Center Version 3.3	Sun Microsystems, Inc. - Java(TM) Platform SE 6 U23
Larus-Stone pcpim Version 8, 0, 0, 0	Version 6.0.230.5
Launch NX session	The MathWorks Inc. - MATLAB Version 7.11.0.584
LEGO MINDSTORMS NXT Version 2.0	the VideoLAN Team - VLC media player Version 1,1,5,0
LTspice IV Version 4.08o	TightVNC Win32 Viewer Version 1.5.2.0
Macrovision Corporation - LMTOOLS Utility Version	VMware Converter Hosted Version 3.0.3 build-132753
10, 8, 5, 0	VMware vCenter Converter Standalone Version 4.0.1
MDSolids Version 3.05	build-161434
Mentor Graphics - PCLS_OK MFC Application Version	VMware Workstation Version 6.5.4 build-246459
2, 0, 0, 0	VMware, Inc. - vSphere Client Version 4.1.0.12319
Mentor Graphics Corporation - Precision Synthesis	Wolfram Research, Inc. - Mathematica Kernel Version 7,
Version 2010a_Update1.228	0, 17, 34024
Microsoft (R) Visual Studio (R) 2010 Version	Wolfram Research, Inc. - Mathematica Version 7, 0, 17,
10.0.30319.1	34023
Microsoft Corporation - .NET Compact Framework	Xilinx Bash shell
Version 3.5	Xilinx Software Development Kit
	YoYo Games Ltd - Game Maker Version 8.0

Linux Remote Access Terminal Server

Dell PowerEdge 2950, Intel Xeon Dual Quad Core @ 3.0 GHz, 64GB RAM, 300GB HDD, 1 GbE, Suse Linux 10.x

- Cadence Design Tools
- Synopsys Design Tools
- Mentor Graphics Design Tools

Wireless access is available in most buildings on campus

IT Support

The University has an instructional technology department. This department provides campus-wide open labs, technology in classrooms and supports IT access for most of the campus. Their technology is replaced on a three year cycle and that equipment is paid for out of a campus-wide technology fee of \$5.00 per credit hour. They primarily support Windows 7 Enterprise. While this equipment supports the needs of most of the campus, the EAS college has additional needs for specialized equipment and software. Because of this, EAS maintains its own IT department. That department is funded by instructional fees. The fee structure for academic year 2010-11 is \$15 per EAS credit hour with a maximum of \$180 per student per semester. This applies to all courses offered in EAS with the exception of graduate thesis courses. There are no additional fees levied within the College. The purpose of the fee is to assist the College in providing exceptionally high-quality instruction, including, but not limited to, support for all instructional labs managed by EAS, support for faculty office equipment used in instruction, support for the College IT network and servers, college or departmental help centers, and student run mentoring programs.

The computer equipment in the laboratories of the College is maintained by one full-time staff member and student assistants.

24/7 Remote Access to Windows and Linux Servers

EAS IT provides students and faculty with Remote Access Terminal Service (RATS) to two Window 2008 R2 Servers and a SuSE Linux Server with licensed software packages used in various classes. It allows students to access remotely these software packages and computing facilities at home anytime via UCCS Virtual Private Network. One server runs Windows 2003 R2 operating system and contains software packages such as MATLAB R2008b, Mathematica, Ansoft including Ansoft Designer, HFSS, Q3D Extractor, ePhysics 3 and Optimetrics, Comsol, Mathworks/Matlab, Agilent Advanced Design Systems. It can be accessed using Windows Remote Desktop Client, Mac Remote Desktop Client, or Linux RDESKOP client. The other server runs SuSE Linux Enterprise Desktop 11 64 bit operating system with OpenMPI and NoMachine NX Enterprise Terminal server and contains Mathworks/Matlab, Mentor Graphics, Synopsys, VORPAL 3.0.2, Agilent Advanced Design Systems, Cadence Design Systems. It can be accessed using using NoMachine NXclient(graphical remote desktop client) or ssh (shell environment).

UCCS Campus Computing Resources

The UCCS Information Technology Department operates over 500 Windows and 45 Macintosh computers in Student Classrooms and Open Labs throughout the campus. Open labs are open to all students, staff and faculty, while computerized classrooms are reserved for classrooms, conferences, and other sponsored programs.

PC Hardware Specifications:

- 22" Dell Optiplex 780
- Core 2 Quad 2.83 GHz Processor
- 4 GB RAM
- 320 GB Hard Disk Drive
- Windows 7 64-bit Operating System

Macintosh Hardware Specifications:

- 27" Macintosh computer
- Core 2 Duo 3.06 GHz Processor
- 4 GB RAM
- 1 TB Hard Disk Drive
- iMac 10.1 Operating System

Printer Specifications:

- HP LaserJet 9050dn Printer.

Campus Open Labs

Open Labs are located on the second floor of the El Pomar Center in the Library Commons area, and in Columbine Hall room 231. Included in the El Pomar Center Open Lab are several computerized rooms designated for group study (two or more persons) These Group Study Rooms are located in EPC Rooms 212, 213, 214, 216, 217, 226, 227, 228, and 230 contain 2 PC's each. The Multimedia Lab is an additional Open Lab located in the El Pomar Center for the purpose of video editing and graphic design.

El Pomar Center Open Lab:

- 205 PCs
- 4 Macs
- 2 Flatbed Scanners
- 9 High-Capacity B&W Laser Printers

El Pomar Center Multimedia Lab:

- 7 PC's
- 2 Macs
- 2 Flatbed Scanners
- 1 High-Capacity B&W Laser Printer
- 6 Digital Video Recording Devices.

COH 231:

- 42 PC's
- 8 Macs
- 2 Flatbed Scanners
- 4 High-Capacity B&W Laser Printers

Computerized Classrooms

Computerized Classrooms are located throughout Columbine Hall, with an additional overflow classroom in the El Pomar Center and in Centennial Hall. PC hardware is used in all classrooms except for COH 209 which uses Mac's. A single High-Capacity B&W Laser Printer is also available in each classroom.

- EPC 239 – 36 PC's
- COH 209 – 31 Mac's
- COH 220, 221, 223, 224 – 22 PC's each
- COH 229 – 24 PC's
- COH 230, 329 – 28 PC's each
- CENT 245 – 32 PC's

In addition, there are several Computerized Classrooms that utilize a single Instructor Podium Computer. These systems are identical to the PC's in the open labs and computer classroom.

- Centennial Hall – 7 Podiums

- (CENT 102, 106, 186, 188, 191, 192, 203)
- Columbine Hall – 19 Podiums
(COH 103, 114, 115, 116, 117, 127, 128, 132, 135, 136, 214, 216, 317, 322, 323, 324, 325, 333, 334)
- Dwire Hall – 9 Podiums
(101, 103, 104, 106, 112, 114, 121, 201, 303)
- Science-Engineering – 8 Podiums
(SE-B134, B136, B138, B211, B213, B215, B216, B217)
- University Hall – 9 Podiums
(UHALL 109, 132, 133, 140, 141, 165, 168, 216, 317)

Public Access Computers are available in the El Pomar Center on the 2nd floor near the west entrance, located along either side of the Library Reference Desk. A total of 10 PC's are available for public access.

Campus Computing Facilities

- 2 Redundant Datacenter: 30 kW UPS
 - Cisco Nexus 5010, 4 x Nexus 2010 in each center with 10GbE uplinks to Nexus 7000 cores.
 - VMware Infrastructure
 - 3 x Dell M 600 Blades in 1000E Chassis.
 - Microsoft Hyper-V Infrastructure in each data center
 - 4 x Dell M 600 Blades in 1000E Chassis.
 - 5 Node HP/Lefthand iSCSI SAN in each Data Center.
 - 2 x Brocade Edge Iron switches with dual 10GbE to redundant storage network.

Campus Network Facilities

- Dual Campus Routing Cores
 - Cisco Nexus 7000, Cisco 6513 in each routing center with dual 10GbE uplinks to all major buildings.
- Wireless network covering all campus buildings.
 - 350 Aruba access points providing B/G wireless with B/G/N in 3 newest building installations.
- Internet access via 2 x 1 GbE connect to Southern Colorado Optic Network (Scone)
 - Connection to Front Range Gig Pop (FRGP) for commodity internet, access to NLR Transit Rail and Internet2 Packet service.
 - Peer routing to CU Campuses, Colorado State U, Colorado School of Mines, Denver University, U of Wyoming via FRGP
- Cisco ASR 1006/1002 routers, Cisco ASA 5580 firewalls at network edge

- Southern Colorado Educational Consortium Network
 - Network connections via Scone and private peering to 2 Southern Colorado Community Colleges with connections planned to a total of 10 members.
 - Cisco Telepresence environment including: Redundant Call Managers, Telepresence management server, TP Multipoint Switch, Video conference server, Recording server.
 - Cisco Telepresence CTS1100 systems installed at 3 Locations for remote instruction. Supports classes currently offered by College of Engineering and Bethel School of Nursing.

Columbine Hall Lab Hours

Monday – Friday 8:00 am – 10:00 pm

Saturday 8:00 am – 5:00 pm

Sunday: Closed

EL Pomar Labs (Kraemer Family Library) Computer Assistance Desk Hours

Fall / Spring Hours

8:00 am - 10 pm (MON- THU)

8:00 am - 8:00 pm (FRI)

10:00 am - 8 pm (SAT)

11:00 am - 10 pm (SUN)

C. Guidance

Students are provided guidance for use of the prototyping shop facilities and tools and all laboratory facilities. A full time shop supervisor, along with qualified student assistants, supervises all activity in the prototyping shop and provides training for student use of the facilities and tools. Once students are fully trained and qualified to operate tools and equipment safely, they are permitted to work independently under the supervision of the shop employees.

Laboratory activities are directly supervised by lab assistants under the overall direction of the full-time faculty member who has responsibility for the class and/or laboratory. Lab assistants provide background information on the purpose and scope of the laboratory activity, direction on how to use the equipment safely and appropriately, and guidance on how to present the results. Guidance for use of computing facilities is provided by both the EAS and campus IT support groups through direct contact in person and via e-mail or telephone. In addition the both IT groups maintain extensive web pages of instructions, directions and policies.

D. Maintenance and Upgrading of Facilities

Laboratory facilities, including the prototyping shop, and student computer labs are reviewed yearly by the laboratory committee and the department chair. Where appropriate, the review includes other faculty and staff. For example, the shop supervisor provides input on

laboratory and shop equipment, faculty users of various laboratory classrooms provide their input, and the college IT department provides information on all computer and software related items. The yearly review, normally undertaken in the spring semester in conjunction with budget planning, results in a prioritized list of needed equipment, supplies, and software. As part of the budget process, priority purchases are identified at the time of the review and purchases are planned. The list and purchasing plan is modified throughout the year, as necessary, to meet changing circumstances or needs.

E. Library Services

The Kraemer Family Library has a very good physical collection of technical books and journals to serve the needs of the College of Engineering and Applied Science. In addition, a cooperative agreement with libraries in the state of Colorado, excellent access to electronic journals, and an extensive inter-library loan system together provide ample support for all educational and research needs of the college.

“The Kraemer Family Library's mission is to provide information services, sources, and instructional support services that are essential to the teaching, research, and service mission of the University of Colorado at Colorado Springs.”
(from <http://www.uccs.edu/~library/services/faculty/studenteng.html>)

Located in the El Pomar Center, the library's staff of 26.5 includes nine (9) professional librarians with master's degrees, eleven (11) library technicians in classified staff positions, and numerous student employees (approximately 6.5 FTE per year). The Library occupies a total of 108,000 assignable square feet (ASF) with seating space for 1,300 Library users. In addition, the Library contains 27 group study rooms including a parent/child study room and 9 computer-equipped study rooms. The Library's "information commons" consists of a computer lab containing nearly 200 personal computers surrounding the Library reference section. In addition, the area holds a multimedia development lab and an assistive technology lab for students with disabilities. The Library also has an enclosed computer lab/classroom that is frequently used for instructional sessions with classes.

The library staff includes subject librarians who specialize in maintaining and enhancing the collection as well as access to electronic materials. Requests for books, journal subscriptions, or other materials are made through the subject librarian. There is one subject librarian who specializes in engineering.

“The subject librarian assigned to each subject area is responsible for the overall analysis of the collection, and for the identification of topics or aspects of the collection needing further development. He/she is also responsible for the expenditure of the library fund for that subject area. Within the general restrictions of budget and collection needs, the librarian has the final responsibility for determining which items are purchased for the collection. Each librarian depends heavily on faculty recommendations, requests, and guidance in selecting materials.” (from <http://www.uccs.edu/~library/services/faculty/request.html>)

The Kraemer Family Library houses a growing collection of over one million physical volumes – books, print journals, microform, videos, DVDs, maps, and government documents – and provides access to an extensive array of electronic resources. The book collection includes over 32,000 volumes in engineering, computer science, and related fields in both print and electronic format.

The Interlibrary loan (ILL) program at the Kraemer Family Library is available to all students, faculty and staff. The program provides access to materials that are not available in the library or through the cooperative agreement with Colorado libraries. Books, journal articles, theses, and other materials may be requested through ILL as long as they are not otherwise available. There is typically no charge for ILL services unless copyright fees are in excess of \$30. ILL requests are made through an online request system called ILLiad.

The library maintains extensive access to online technical journals. The following is a list of indexes and databases specific to the College of Engineering and Applied Science:

Engineering and Applied Science Databases

Engineering Village 2 1969-
IEEE Xplore* 1988-
Compendex 1970-
INSPEC 1969-
Knovel Library
ACM Digital Library* years vary
SPIE Digital Library*

Related Engineering Resources

Scopus Elsevier 1966-
Annual Reviews 1996-
Computer Database* Gale/InfoTrac 1980-
MathSciNet 1940-
Institute of Physics Journals* years vary
Physical Review Online Archives (PROLA)
ScienceDirect* Elsevier 1997-
SciFinder Scholar 1907-
SpringerLink 1997-
Wiley Interscience Journals*
CEDB(Civil Engineering Database)
Homeland Security Digital Library U.S. Dept of Homeland Security

Selected General Databases

Academic OneFile*
Academic Search Premier* EBSCOhost years vary-
Dissertations and Theses Proquest 1861-
WilsonWeb OmniFile Full Text Mega* H.W. Wilson 1982-

* database contains partial or complete full-image and/or full-text coverage of journal articles (from <http://www.uccs.edu/~library/databases/engineering.html>)

In addition, the Library offers ebook collections from NetLibrary, Knovel, Springer, SPIE, IEEE, and Books 24x7 that include numerous titles in engineering and related fields. All electronic resources are available through links from the Kraemer Family Library webpage. Faculty and students can access resources 24/7 from any computer on campus or from anywhere off-campus by establishing a VPN connection to the campus network. The Library uses a link resolver, SerialsSolutions, to provide an A-Z listing of available journal titles and links from

various resources to the available full-text of articles. This includes links to many free or open access resources. Links can also be added to search engines such as Google Scholar and Scirus.

A cooperative agreement between many Colorado libraries makes material available from across the state. Among many others, members include libraries from Colorado College, Colorado State University, University of Colorado at Boulder, University of Colorado Health Sciences Center, University of Northern Colorado, University of Wyoming, and Western State College of Colorado. The catalog to access these materials is called “Prospector”:

“Prospector is a unified catalog of academic, public and special libraries in Colorado and Wyoming. Through Prospector you have access to 30 million books, journals, DVDs, CDs, videos and other materials held in these libraries. With a single search you can identify and borrow materials from the collections and have them delivered to your local library.” (from <http://www.coalliance.org/prospector/prospectornews/about>)

The library provides a reserve service for faculty to place material on reserve to insure student access. Typically required reading materials, heavily used books, or audio-visual materials assigned for use in a class would be candidates to be placed on reserve. Faculty may place various restrictions on the loan period for reserve materials in order to make them more widely available.

The library also provides photocopy services, library instruction, research consultations, and library workshops which are open to faculty, students, staff, and the general public.

F. Overall Comments on Facilities

Student safety is a primary concern for all laboratory experiences and for all work completed in the prototyping shop. A full-time shop supervisor and several part-time assistants supervise student work in the shop. Students must demonstrate knowledge of safe and appropriate use of each machine or piece of equipment before being permitted to use it independently. All laboratories are conducted under the supervision of a faculty member or a student assistant hired specifically to conduct the labs. Students are trained on appropriate use of the equipment before beginning each hands-on laboratory, and supervised throughout the duration of the laboratory period.

CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

The Mechanical and Aerospace Engineering Department at UCCS is a unit within the College of Engineering and Applied Science (EAS). The Dean of EAS reports to the campus Provost, and has budgetary and administrative responsibility for the college. Each department in the college has a Department Chair responsible for coordinating teaching assignments, space utilization, and external representation.

The MAE Department Chair is elected by the full-time faculty of the department with the concurrence of the Dean and serves for three year repeatable terms. The major policy committees within the department are the Graduate Committee and the Curriculum Committee. Most policy and procedural matters are decided upon by a vote of the full-time faculty following recommendations from the Graduate Committee or Curriculum Committee.

With this structure, the department faculty as a whole bears immediate responsibility for the curriculum and for the quality and continuity of the program. Individual faculty, acting either as members of committees, or in their role as faculty, have the opportunity to analyze, discuss, advocate and vote with regard to changes in the program, or changes to policies or procedures that affect the program. The Department Chair and the College Dean work cooperatively with the faculty to ensure that all policies and procedures remain consistent with campus and college guidelines, that budget planning, facilities and expenditure procedures are adequate to support the program and that assessment is performed and the results acted upon.

This leadership structure functions very well for the department and college. Since all faculty are engaged in important program decision-making, there is no single point-of-failure danger, and all faculty views are represented in the process. Additional input from constituents, including students, graduates, employers of graduates, and other academic institutions comes partly through assessment procedures described elsewhere in this document and also through the MAE Advisory Board. The structure of the department provides flexibility to adapt to changing circumstances, close integration between faculty actions and department policies, and long-term continuity and stability.

B. Program Budget and Financial Support

Budget

The program budget is established by the Dean of Engineering and Applied Science with input from the three department chairs in the college. The Dean, working with the college financial assistant prepares a budget for the upcoming fiscal year in early spring of each year. The budget also includes approximate budgeting for the four fiscal years following the upcoming year. The budget is presented and discussed at one or more Department Chairs meetings during the spring semester. Once consensus is reached, the budget is adopted for the upcoming year. Institutional support has been consistent for many years. Virtually all of the college budget is composed of permanent funding from the State of Colorado. The two main sources of temporary funds are overhead return on research and external gift money. Most overhead return is directed toward support for developing research, and gift money is typically used for one-time expenditures.

Teaching Support

The institution supports teaching in the department by hiring graders, course assistants, lab assistants, and help center staff. The policy, which is applied with some flexibility, as needed, is to hire a grader for any undergraduate class with 25 or more students enrolled. Lab assistants are hired for any laboratory class which needs one. A course assistant is currently used to support the senior design class which has grown large enough to be difficult for a single professor, but which we are reluctant to split into multiple sections for logistical reasons. An MAE help center provides support for all undergraduate classes and is typically staffed by upper division or graduate students for 20 hours per week.

Infrastructure

Most infrastructure and facilities including undergraduate laboratory and faculty office computers, materials and supplies, some laboratory equipment and normal departmental operating costs come from the general fund budget. The remainder of the laboratory equipment is funded by student fees which are paid for all classes taken in the College of Engineering and Applied Science. The disbursement of student fees is handled in a manner similar to the general budget process described above. The department laboratory committee maintains a priority list of equipment which is regularly updated as equipment is purchased or as needs change or new needs become apparent.

Adequacy of Resources

The resources described above are very adequate to support the achievement of the student outcomes. Office and grader support for faculty is sufficient for both full-time and honoraria faculty to achieve excellence in delivering courses. The year-to-year budget and budget process allows for stability and multi-year planning. The revenue stream from student fees allows the laboratory equipment to be maintained adequately, and to be upgraded or adapted, as needed, in a continuous way.

C. Staffing

The staff support for the department of Mechanical and Aerospace Engineering is adequate to support the department in reaching the Program Educational Objectives and to support the students in achieving student outcomes.

There is one full-time administrative staff member assigned solely to the department. She hires and supervises a part-time student aide. The Prototype Shop is overseen by a full-time technician (who also has duties supporting the laboratory equipment in MAE and ECE). He typically hires one or two part-time student aides to help in the shop. The department is also supported by college staff including the full-time college financial assistant, a grants administrator (who has other duties in the CS department), and a personnel coordinator (who has other duties in the ECE department). In addition, the department is supported by a full-time engineering advisor who advises all freshman and undecided engineering students and conducts senior audits for graduation, a part-time internship coordinator for the college, and a full-time director of student support for the college. Further, EAS has an IT department (separate from campus IT) with a full-time IT professional and several student aides. Several of the student aides have primary responsibility for supporting a single department, and one of the aides is assigned to MAE.

D. Faculty Hiring and Retention

When a faculty position is to be filled, the department applies for and receives permission from the campus to advertise the position early in the fall semester. The department faculty meet and agree on the wording of advertisements which are run in appropriate national publications during the fall semester. In the past, these advertisements have been in print publications such as The Chronicle of Higher Education, Mechanical Engineering Magazine, etc. However, in recent years it has been found that it is much more cost effective to use on-line outlets such as Academic Keys Online, The Chronicle of Higher Education Online, Academic Careers Online, etc. Applications are collected electronically through a campus web-based application site, and are made available to the search committee for review. The search committee typically consists of all full-time faculty, unless there is a conflict-of-interest or extenuating circumstances. After reviewing the applications individually, the search committee meets and agrees upon a short list of 10-20 candidates. These candidates are contacted by the chair to verify continued interest in the position and to confirm permission to contact references. The references are split up and contacted by sub-groups of the search committee. At a subsequent search committee meeting, the list is further shortened to 4-7 candidates to be interviewed by telephone. Telephone interviews are conducted and the committee decides on three candidates to bring to campus for interviews. These interviews typically last a day and a half and allow the candidate to meet individually with advisory board members, all the department faculty, the dean, and the provost. The candidate is asked to make a research presentation during the interview visit, tours the department facilities and the campus and eats several meals with subsets of the search committee. Following the campus visits, the search committee meets and agrees on a top candidate. Following approval from the dean, the chair extends an offer to the candidate and negotiates conditions of the offer. Upon acceptance of the offer by the candidate, the process is concluded.

The MAE faculty are the heart of the program and every effort is made to retain qualified faculty. Within the constraints of state budgets, faculty salaries are made as competitive as possible, and care is taken to avoid salary inversions wherever possible. Limited funds are available for travel to conferences, and untenured faculty are supported through initial course offloads and reduced committee workloads.

E. Support of Faculty Professional Development

All faculty in the College of Engineering and Applied Science have automatic access to limited travel funds to attend professional conferences and participation in conferences and professional organizations is encouraged. Other opportunities for participation in professional development or professional organizations is supported via funded research projects, campus research support such as the Creative Research Creative Works (CRCW) grants, and on a case-by-case basis through the EAS Research Development Committee (RDC). The University of Colorado has a sabbatical program for which all faculty become eligible after six years of full-time service. The sabbatical program is heavily focused on faculty professional development and requires a sabbatical plan as part of the application, and a report describing accomplishments and fulfillment of the plan upon completion of the sabbatical. Taken together, these various avenues for faculty development provide adequate resources and support. While it would certainly be desirable to have greater resources in this area, the support necessary for maintaining

professional competence, maintaining and improving classroom teaching and learning, and progressing toward rank advancement and tenure are in place.

PROGRAM CRITERIA

The program criteria for mechanical engineering programs require that graduates have an ability to apply principles of engineering, basic science, and mathematics to model, analyze, design and realize systems, components or processes, and that graduates are prepared to work professionally in both thermal and mechanical areas.

The required undergraduate curriculum requires 8 hours of calculus-based physics (PES 1110 and 1120) and 5 hours of general chemistry (CHEM 1030). Students are also required to take calculus up through Calculus III (MATH 2350), Introduction to Differential Equations (MATH 3400), Linear Algebra (MATH 3130), and either Probability and Statistics (MATH 381) or Engineering Probability and Statistics (ECE 3610).

These topics are used in several MAE classes including, but not limited to, Fluid Mechanics (MAE 3130), Heat and Mass Transfer (MAE 3310), Intermediate Dynamics (MAE 4402), and Automatic Control of Aero/Mech Systems (MAE 4421).

All students take the senior design sequence (MAE 4510 and 4511) which is structured around a major engineering design experience. However, any given student would typically work on only a single senior design project, and that project could be either mechanical or thermal, but is unlikely to cover both areas adequately. Therefore, Thermodynamics II (MAE 3302) and Machine Design (MAE 3501) both incorporate smaller, but still significant design projects into the curriculum. This insures that all students will have the ability to work professionally in both thermal and mechanical systems.

In addition to the course coverage described above, in the MAE department at UCCS these criteria are incorporated as the last two (“l” and “m”) Student Outcomes and are reviewed and assessed along with the rest of the Student Outcomes as described in the sections on Criterion 3 Student Outcomes and Criterion 4 Continuous Improvement.

Appendix Listing

A. Course Syllabi

B. Faculty Vitae

C. Equipment in Support of Instruction

D. Institutional Summary

E. Advisory Board

F. Exit Interview and Survey Summary and Review

G. Alumni Survey Summary

H. Course Assessment Materials

Appendix A – Course Syllabi

MAE 1502 Principles of Engineering

1. Course number and name: MAE 1502 Principles of Engineering
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Julie Albertson
4. Text book, title, author, and year: n/a
5. Specific course information
 - a. catalog description

The course presents a balanced coverage of the fundamental concepts of engineering principles and the practical exposure to a laboratory experience. The principles presented in the lecture setting and the experiences gained in the laboratory setting are intrinsically intertwined. Both approaches are needed for a student to gain conceptual understanding, and to investigate and engage in meaningful engineering both in isolation and in team environments.
 - b. prerequisites or co-requisites: none
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - To provide the student with a conceptual understanding of the principles of engineering. These principles will be presented in greater breadth and depth in follow-on engineering courses.
 - To provide the student with practical laboratory experiences in order to facilitate conceptual understanding. The laboratory experience will be based on project based education. Several of the projects will be individually accomplished in one session, while others require a team effort over several sessions.
 - To provide the student with an appreciation of the ethnic and gender issues and their relationship to the engineering profession.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (e) An ability to identify, formulate, and solve engineering problems.
 - (f) An understanding of professional and ethical responsibility.
 - (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
 - (j) A knowledge of contemporary issues.
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

7. Brief list of topics to be covered

Introduction of the following:

- Engineering history
- Teamwork skills
- Time management
- Engineering ethics
- Technical communication
- Engineering design process
- Simple machine principles
- Statics
- Dynamics
- Strengths of materials
- Electrical systems
- Control systems
- Fluid and energy systems
- Aerodynamics

MAE 1503 Introduction to Engineering Design

1. Course number and name: MAE 1503 Introduction to Engineering Design
2. Credits and contact hours: 2 credit hours, 32 contact hours
3. Instructor's name: Julie Albertson
4. Text book, title, author, and year: *ENGINEERING DESIGN*, Dym & Little, 3rd Ed, 2008
5. Specific course information
 - a. catalog description

This course helps students understand the engineering design process and introduces several engineering tools. The course also details the engineering career and applications in society.
 - b. prerequisites or co-requisites: none
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Demonstrate a fundamental understanding of the engineering design process.
 - Effectively apply the design process to individual and team projects.
 - Demonstrate an understanding of basic CAD modeling, 2-D & 3-D sketching and print reading, machining processes and procedures, and industry standards and effectively apply these to engineering design problems.
 - Effectively communicate technical material in written, graphical and spreadsheet formats.
 - Effectively solve engineering problems in a team environment.
 - Effectively demonstrate understanding of contemporary engineering sustainable design practices.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
 - (g) An ability to communicate effectively.
 - (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

7. Brief list of topics to be covered

- Design process: all aspects from problem definition, brainstorming, research, customer needs, reverse engineering, budget, life cycle analysis, conceptual and final design reviews, marketing, fabrication, & disposal
- Teamwork, technical communication, ethics of engineering design
- Hand drawing: isometrics, obliques, dimensioning & three-views
- Prototype lab: students build two was parts in the lab using the vertical mill & lathe
- Computer aided design using Inventor 2011

MAE 2055 Mechatronics I

1. Course number and name: MAE 2055 Mechatronics I
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Kyle Webb
4. Text book, title, author, and year: *Electrical Engineering Principles and Applications*, Allan R. Hambley, 2011
5. Specific course information
 - a. catalog description

An introductory course in analog and digital electronic circuits. Ohm's law and Kirchhoff's current and voltage laws are introduced and applied to the analysis of resistive circuits. Operation and use of common test equipment is discussed and practiced. The concept of impedance is presented and applied to the analysis of reactive circuits. The analysis and design of digital logic circuits is introduced.
 - b. prerequisites or co-requisites: MATH 136
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Apply Ohm's Law and Kirchhoff's Laws to the analysis and design of simple resistive circuits.
 - Understand and create schematic diagrams of simple electronic circuits.
 - Apply Thévenin's and Norton's Theorems to model unknown or complicated networks.
 - Use common test equipment to take measurements in the lab for prototyping and debugging electronic circuits.
 - Perform transient and steady-state analysis of RC and RL circuits.
 - Analyze and design simple digital logic circuits.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data
 - (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability
 - (d) An ability to function on multi-disciplinary teams
 - (f) An understanding of professional and ethical responsibility
 - (g) An ability to communicate effectively

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

7. Brief list of topics to be covered

- Fundamentals of electricity
- Resistance and conductance
- Ohm's law
- Kirchhoff's laws
- Mesh/nodal analyses
- Linearity, superposition, I-V characteristics
- Thévenin and Norton equivalent circuits
- Inductors and capacitors
- Transient and steady-state responses of RL/RC circuits
- Ideal transformers
- Fundamentals of digital electronic circuits
- Number systems, logic gates, truth tables, DeMorgan's laws

MAE 2103 – Engineering Mechanics I

1. Course number and name: MAE 2103 – Engineering Mechanics I
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Steve Tragesser
4. Text book, title, author, and year: *Engineering Mechanics: Statics and Dynamics (12th Ed)*, R.C. Hibbeler, 2009
5. Specific course information
 - a. catalog description

Force vectors, moments of force, equilibrium of a particle and rigid bodies, structural analysis and trusses, internal forces and shear, friction, center of gravity and mass, moments of inertial, virtual work, and kinematics of particles
 - b. prerequisites or co-requisites: Prereq: MAE 1502, PES 111 Coreq: MATH 235
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Determine the external (support and applied) forces/moments on a particle or rigid body in equilibrium.
 - Determine the equilibrium position of a particle or rigid body.
 - Combine forces and moments into equivalent systems.
 - Determine the internal tension or compression in members of a structure (e.g. a truss).
 - Find the center of mass for a rigid body.
 - Determine the velocity and acceleration of a particle (kinematics).
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(e) An ability to identify, formulate, and solve engineering problems
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - Force vectors
 - Moments of force
 - Equilibrium of a particle and rigid bodies

- Structural analysis and trusses
- Friction
- Center of gravity and mass
- Moments of inertial
- Kinematics of particles

MAE 2104 Engineering Mechanics II

1. Course number and name: MAE 2104 Engineering Mechanics II
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Steve Tragesser
4. Text book, title, author, and year: *Engineering Mechanics: Statics and Dynamics*, R.C. Hibbeler, 2009
5. Specific course information
 - a. catalog description

Dynamics of a particle; kinetics of a system of particles; kinematics of rigid bodies in two and three dimensions; free and forced vibrations with and without viscous damping.
 - b. prerequisites or co-requisites: Prereq: MAE2103, Coreq: MATH3400
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - After completing this course, you should be able to:
 - Solve kinetics and kinematics problems for linear and rotational motion for a particle and system of particles using Newton's 2nd Law and Euler's Law.
 - Understand and identify equations of motion.
 - Use the principle of work and energy to solve kinetics problems.
 - Use the principle of impulse and momentum to solve kinetics problems.
 - Solve kinematics and kinetics problems in rotating reference frames.
 - Determine mass moments of inertia for rigid bodies.
 - Solve kinetics problems for planar rigid bodies using Euler's Law.
 - Determine the response of free, forced, and damped vibratory systems.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(e) An ability to identify, formulate, and solve engineering problems
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - Kinetics of a particle

- Kinetics of a system of particles
- Kinematics of a particle with rotating frames
- Kinematics of rigid bodies in two and three dimensions
- Free and forced vibrations

MAE 2200 Materials Engineering

1. Course number and name: MAE 2200 Materials Engineering
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Jesse McClure
4. Text book, title, author, and year: *Materials Science and Engineering: An Introduction*, William D. Callister, 2010
5. Specific course information
 - a. catalog description: Introduction to engineering materials emphasizing metals and alloys and including ceramics and plastics. Principles behind material development, selection and behavior are discussed with special emphasis on relevance to load bearing applications. The relationship between microscopic characteristics and their effect on macroscopic properties will be explored. The lab component will involve metallurgical testing and analysis of common material processing techniques
 - b. prerequisites or co-requisites: Prereq: CHEM 1030, PES 1110, MATH 1350
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Use the Periodic Table to explain concepts of oxidation-reduction, oxidation number, bonding strength, and ionization potential.
 - Select the appropriate mechanical properties for design under various loading situations, such as quasi-static, cyclic, impact, and low and elevated temperatures.
 - Apply the principles of diffusion to design a process for surface hardening.
 - Apply Cooling Curve and Lever Law to demonstrate Phase Transition and Phase Analysis.
 - Use the characteristics of various grades of steel in design and failure analysis.
 - Design a production procedure for mechanical and/or thermal processing.
 - Select the appropriate engineering material and dimension for a given application.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data.

(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

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

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

(l) an ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes

7. Brief list of topics to be covered

- Crystalline structures
- Materials testing
- Stress-strain concepts
- Diffusion
- Cooling curves
- Heat treatments of steels

MAE 2301 Engineering Thermodynamics I

1. Course number and name: MAE 2301 Engineering Thermodynamics I
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: James Stevens
4. Text book, title, author, and year: *Thermodynamics, An Engineering Approach*, Cengel, Y.A., Boles, M.A., 2011 with accompanying *Property Tables Booklet*
5. Specific course information
 - a. catalog description
First and second laws of thermodynamics. Properties, states, thermodynamic functions, entropy, and probability.
 - b. prerequisites or co-requisites: Prereq: MATH 1350 and PES 1110
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
The student should understand basic principles of thermodynamics, be able to analyze closed and open systems in terms of both the First and Second Laws of thermodynamics.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (e) An ability to identify, formulate, and solve engineering problems
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
 - (l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
 - (m) Preparation to work professionally in both thermal and mechanical systems areas
7. Brief list of topics to be covered
 - Introduction and nomenclature
 - Properties and property relationships
 - Property tables and ideal gas law
 - 1st law of thermodynamics for closed systems
 - Conservation of mass
 - 1st law of thermodynamics for open systems
 - Introduction to the 2nd law of thermodynamics
 - Property relationships for entropy

- Applications of the 2nd law of thermodynamics
- Introduction to exergy

MAE 3005 Measurement Lab

1. Course number and name: MAE 3005 Measurement Lab
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Valmiki Sooklal
4. Text book, title, author, and year: n/a
5. Specific course information
 - a. catalog description

Fundamental technical measurement techniques, measurement processes, analog and digital measurements, system response, sensors, signal conditioning, readout data processing, measurement standards and treatment of uncertainties; applied mechanical measurements: counters, displacement, stress and strain, force and torque, temperature, and pressure.
 - b. prerequisites or co-requisites: Preq: MAE3055 and MATH3400
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Students will conduct experiment involving temperature, length, weight, voltage and strain measurements.
 - Students will be required to collect, analyze, and apply statistics to interpret and represent experimental data.
 - Students will gain a basic understanding of data acquisition systems and LabView software.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data
 - (d) An ability to function on multi-disciplinary teams
 - (e) An ability to identify, formulate, and solve engineering problems
 - (g) An ability to communicate effectively
 - (j) A knowledge of contemporary issues
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
7. Brief list of topics to be covered
 - Measurement methods
 - Static and dynamic signals
 - Probability and statics

- Uncertainty analysis
- Analog devices
- Temperature, pressure, strain, power measurements

MAE 3055 Mechatronics II

1. Course number and name: MAE 3055 Mechatronics II
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Timothy Scully
4. Text book, title, author, and year: MAE 2055/3055 Course Notes – Timothy M. Scully, 2009
5. Specific course information
 - a. catalog description

This course extends the discussion of analog and digital circuits from MAE 2055. Additional analog and digital components and circuits are introduced so that a measurement system may be built. The course is centered on a notional data acquisition system (DAS), and the function/operation of the components that make up a DAS. Fourier analysis, signal sampling and uncertainty analysis will be addressed. The course culminates with a final project involving the design, construction and demonstration of a measurement system.
 - b. prerequisites or co-requisites: Prereq: MAE 2055, MATH 2350
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Use common test equipment to make electronic measurements.
 - Calculate and measure fundamental electrical properties of voltage, current and resistance
 - Design, build and test analog and digital circuits.
 - Be capable of working as a productive member of a team.
 - Be capable of communicating (written and verbal) individually and as part of a diverse design team in a professional manner.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data.
 - (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
 - (d) An ability to function on multi-disciplinary teams
 - (f) An understanding of professional and ethical responsibility
 - (g) An ability to communicate effectively

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

7. Brief list of topics to be covered

- Analog and digital circuits
- Transistors
- Op-amps
- Signal processing

MAE 3130 Fluid Mechanics

1. Course number and name: MAE 3130 Fluid Mechanics
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Julie Albertson
4. Text book, title, author, and year: *Fundamentals of Fluid Mechanics*, Munson, Young, Okiishi and Huebsch, 2009
5. Specific course information
 - a. catalog description

Fluids play a significant role in engineering processes, designs, and problems. This course provides the students with a comprehensive understanding of fluid behavior and the tools necessary to solve problems in areas such as internal and external flows, hydraulic systems, buoyancy, laminar and turbulent flows, etc.
 - b. prerequisites or co-requisites: Prereq: MAE2103, MAE2301
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Demonstrate ability to apply standard fluid mechanics terminology to fluid analysis.
 - Effectively apply fluids equations such as Bernoulli, Euler, and Navier-Stokes in fluids problems.
 - Apply control volume analyses to fluid mechanics problems.
 - Demonstrate understanding and ability to apply fluid mechanics concepts for physical modeling, experimentation, and analysis of pipe flows and wind tunnel applications.
 - Demonstrate ability to communicate fluid mechanics principles clearly in written format.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (g) An ability to communicate effectively.
 - (l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
 - (m) Preparation to work professionally in both thermal and mechanical systems areas
7. Brief list of topics to be covered
 - Fluid properties

- Hydrostatic forces, manometry, submerged surfaces, buoyancy
- Bernoulli's equation
- Integral and differential forms of the continuity and momentum Equations,
- Navier-Stokes equations
- Similarity, dimensional Analysis
- Pipe flow
- Boundary layers
- Laminar & turbulent flow
- Lift & drag
- Turbomachines
- Compressible flow

MAE 3131 Fluid Mechanics Laboratory

1. Course number and name: MAE 3131 Fluid Mechanics Laboratory
2. Credits and contact hours: 1 credit hours, 16 contact hours
3. Instructor's name: Julie Albertson
4. Text book, title, author, and year: n/a
5. Specific course information
 - a. catalog description

Laboratory experiments in applying fundamental fluid mechanics theory to the design and analysis of real-world experiments and devices. Requires preparation of laboratory reports and presentation of results.
 - b. prerequisites or co-requisites: Prereq: MAE3005, Coreq: MAE3130
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Apply fundamental fluid mechanics theory to the design and analysis of real-world experiments and devices.
 - Perform basic global and local measurements of such physical parameters as temperature, pressure, velocity, and flow rate using computerized data acquisition systems.
 - Perform uncertainty analysis during the design, measurement, and analysis stages of an experiment.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data
 - (e) An ability to identify, formulate, and solve engineering problems
 - (g) An ability to communicate effectively.
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
7. Brief list of topics to be covered
 - Bernoulli's equation
 - Pipe flow
 - Turbomachinery

MAE 3201 Strength of Materials

1. Course number and name: MAE 3201 Strength of Materials
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Michael Calvisi
4. Text book, title, author, and year: *Mechanics of Materials*, 8th edition, Prentice Hall, NJ, 2011.
5. Specific course information
 - a. catalog description

The theory and application of the fundamental principles of mechanics of materials, including stress, strain, mechanical properties of materials, axial load, torsion, bending, transverse shear, combined loadings, stress transformation, strain transformation, design of beams and shafts, deflections of beams and shafts, buckling of columns, and energy methods.
 - b. prerequisites or co-requisites: Prereq: MAE 2103, MATH 1360, and CHEM 3010
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction

In this course you will learn to determine the forces/stresses and deformations/strains that occur in engineering materials under various configurations (axial load, torsion, bending, shear). Knowing the internal stresses and strains caused by external loads as well as material properties, will allow you to analyze existing structures and design new components for a wide array of engineering applications. Overall, this course builds on the ability to determine forces and reactions as covered in statics and is a fundamental building block for engineering design.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (c) An ability to design a system, component, or process to meet desired needs within reasonable constraints
 - (e) An ability to identify, formulate, and solve engineering problems.
 - (i) A recognition of the need for, and an ability to engage in life-long learning
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
 - (l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes

(m) Preparation to work professionally in both thermal and mechanical systems areas

7. Brief list of topics to be covered

- Stress/strain
- Torsion
- Bending
- Deflection
- Shear and moments

MAE 3302 Engineering Thermodynamics II

1. Course number and name: MAE 3302 Engineering Thermodynamics II
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: James Stevens
4. Text book, title, author, and year: *Thermodynamics, An Engineering Approach*, Cengel, Y.A., Boles, M.A., 2011 with accompanying *Property Tables Booklet*
5. Specific course information
 - a. catalog description

Applications of classical thermodynamics including analysis of gas and vapor cycles for power production and refrigeration, thermodynamic property relationships, psychrometrics and combustion.
 - b. prerequisites or co-requisites: Prereq: MAE 2301
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction

At the conclusion of the course, students should be able to quantitatively analyze several heat engine and refrigeration cycles, solve problems in psychrometric applications and in simple combustion and compressible flow systems and complete engineering design of thermodynamic systems.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
 - (e) An ability to identify, formulate, and solve engineering problems
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
 - (l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
 - (m) Preparation to work professionally in both thermal and mechanical systems areas
7. Brief list of topics to be covered
 - Introduction and review of Thermodynamics I

- Air standard cycles, reciprocating engines
- Otto, Diesel, Brayton cycles
- Rankine cycle
- Vapor compression, gas, and absorption refrigeration
- Introduction to psychrometrics
- Introduction to combustion
- Introduction to compressible flow

MAE 3310 Heat and Mass Transfer

1. Course number and name: MAE 3310 Heat and Mass Transfer
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Julie Albertson
4. Text book, title, author, and year: *Fundamentals of Heat and Mass Transfer*, Incropera, DeWitt, Bergman, Lavine, 2007
5. Specific course information
 - a. catalog description

Heat flows from high to low temperature; heat transfer analysis determines the rate at which this heat is transferred and the temperature distribution in the system. Heat transfer mechanisms include conduction, convection, and radiation. This class is an in-depth exploration of the three different heat transfer mechanisms and associated heat transfer relationships.
 - b. prerequisites or co-requisites: Prereq: MAE3130, MATH 3130, MATH3400
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Demonstrate ability to apply standard fluid mechanics terminology to fluid analysis.
 - Effectively apply fluids equations such as Bernoulli, Euler, and Navier-Stokes in fluids problems.
 - Apply control volume analyses to fluid mechanics problems.
 - Demonstrate understanding and ability to apply fluid mechanics concepts for physical modeling, experimentation, and analysis of pipe flows and wind tunnel applications.
 - Demonstrate ability to communicate fluid mechanics principles clearly in written format.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (e) An ability to identify, formulate, and solve engineering problems.
 - (g) An ability to communicate effectively.
 - (j) A knowledge of contemporary issues.
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
 - (l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes

7. Brief list of topics to be covered

- Steady state and transient conduction
- Forced and natural convection
- Radiation
- Boundary layers

MAE 3311 Heat and Mass Transfer Laboratory

1. Course number and name: MAE 3311 Heat and Mass Transfer Laboratory
2. Credits and contact hours: 1 credit hours, 16 contact hours
3. Instructor's name: Julie Albertson
4. Text book, title, author, and year: n/a
5. Specific course information
 - a. catalog description

Laboratory experiments in applying fundamental fluid mechanics theory to the design and analysis of real-world experiments and devices. Requires preparation of laboratory reports and presentation of results.
 - b. prerequisites or co-requisites: Prereq: MAE3005, Coreq: MAE3310
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Apply fundamental heat and mass transfer theory to the design and analysis of real-world experiments and devices.
 - Perform basic global and local measurements of such physical parameters as temperature and energy using computerized data acquisition systems.
 - Perform uncertainty analysis during the design, measurement, and analysis stages of an experiment.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data
 - (e) An ability to identify, formulate, and solve engineering problems
 - (g) An ability to communicate effectively.
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
7. Brief list of topics to be covered
 - Linear conduction
 - Heat transfer in extended surfaces
 - Transient heat transfer

MAE 3401 – Modeling and Simulation of Dynamic Systems

1. Course number and name: MAE 3401- Modeling and Simulation of Dynamic Systems
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Peter J. Gorder
4. Text book, title, author, and year: *System Dynamics*, Karnopp and Rosenberg, 2006
5. Specific course information
 - a. catalog description

Course presents basic concepts of dynamic behavior, and the analytic and computational techniques for predicting and assessing dynamic behavior. Modeling a basic system, compound system, dynamic stability and natural behavior and response to continuing and abrupt inputs are presented.
 - b. prerequisites or co-requisites: Prereq: MATH 340, MAE 2102 and (MATH 381 or ECE 3610), knowledge of MATLAB.
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - have ability to apply fundamental knowledge in mathematics and mechanical engineering specific subjects to derive mathematical models of dynamic systems [a, b, e]
 - be able to obtain mathematical models of simple systems involving mechanical, electrical, electromechanical, pneumatic, and fluid components using classical modeling techniques and modern simulation tools [a, b, c, e]
 - be able to write numerical simulation codes for response calculations and analyze open-loop behavior of first- and second-order dynamic systems [a, c]
 - be able to obtain linearized models of nonlinear systems [a, b, e], and
 - have proficiency in using commercial simulation software (MATLAB) for modeling and simulation of linear as well as nonlinear systems. [a, c, e]
(Note: Letters in brackets refer to MAE program objectives)
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data
 - (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability
 - (e) An ability to identify, formulate, and solve engineering problems.
7. Brief list of topics to be covered
 - Introduction to dynamic system modeling

- Modeling of simple mechanical systems
- Modeling of electric circuits and networks
- System equations formulation techniques
- Analysis of linear systems
- Block diagrams and signal flow graphs
- Modeling of general mechanical systems
- Linear models of non-linear systems

MAE 3501 Machine Design I

1. Course number and name: MAE 3501 Machine Design I
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Valmiki Sooklal
4. Text book, title, author, and year: *Mechanical Engineering Design*, Budynas and Nisbett. 2010
5. Specific course information
 - a. catalog description

Applied stress analysis and material strength theories for sizing and selecting materials of machine elements, failure and reliability. Selection of fasteners, bearings, gears, springs
 - b. prerequisites or co-requisites: Prereq: MAE2104, MAE3201
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Perform load and stress analyses necessary for the design of various machine components.
 - Apply failure and fatigue principles in the analysis and design of components subjected to static or variable loading.
 - Incorporate design and analysis considerations for machine components such as fasteners, gears, shafts and bearings
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (e) An ability to identify, formulate, and solve engineering problems
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
7. Brief list of topics to be covered
 - Load and stress analysis
 - Deflection
 - Failure theories: maximum shear stress, distortion energy
 - Fatigue
 - Shaft design
 - Screws and fasteners
 - Welding
 - Springs
 - Bearings

- Gears
- Introduction to Finite Element Analysis

MAE 4120 Machine Design II

1. Course number and name: MAE 4120 Machine Design I
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Leal Lauderbaugh
4. Text book, title, author, and year: *Design of Machinery*, Norton, 2007
5. Specific course information
 - a. catalog description

Kinematic theory of planar mechanisms; position, velocity and acceleration analysis, coupler curves, centrodes, analysis and synthesis of 4 bar linkage, engine dynamics.
 - b. prerequisites or co-requisites: Prereq: MAE2104, MAE3501, MATH313
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Analyze and represent the position, velocity and acceleration of a mechanism with a vector model.
 - Design a four bar linkage.
 - Design a cam mechanism to produce motion in a one-degree-of-freedom follower
 - Analyze the motion and power transmission through a gear train.
 - Analyze the mechanical components in single cylinder and multi cylinder engines.
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(e) An ability to identify, formulate, and solve engineering problems
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - Kinematics of mechanisms including linkages
 - IC engines gears
 - Cams and rotary balancing

MAE 4402 Intermediate Dynamics

1. Course number and name: MAE 4402 Intermediate Dynamics
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Valmiki Sooklal
4. Text book, title, author, and year: *Intermediate Dynamics for Engineers*, Crespo da Silva, 2003
5. Specific course information
 - a. catalog description

Kinematics, relative motion, and rotation of particles and rigid bodies, including inertia tensors, Euler's angles and equations. Variational principles, work, energy expressions, and Lagrange's equations. Electrical circuits and electromechanical systems.
 - b. prerequisites or co-requisites: Prereq: MAE2104, MATH3130, MATH3400
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Use the equations of motion to analyze systems involving one or more particles or rigid bodies
 - Use the principles of work and energy to solve problems involving dynamic systems
 - Use the principles of linear/angular impulse and momentum to solve problems involving rigid bodies subjected to accelerated motion
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - (a) An ability to apply knowledge of mathematics, science, and engineering
 - (e) An ability to identify, formulate, and solve engineering problems
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
 - (l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
 - (m) Preparation to work professionally in both thermal and mechanical systems areas
7. Brief list of topics to be covered
 - Review of vectors

- Relative motion
- System of particles
- Rigid body analysis
- Generalized coordinates
- Virtual work
- Lagrange's Equations

MAE 4421 Control of Aerospace and Mechanical Systems

1. Course number and name: MAE 4421 Control of Aerospace and Mechanical Systems
2. Credits and contact hours: 3 credits, 48 credit hours
3. Instructor's name: Peter J. Gorder
4. Text book, title, author, and year: *Control Systems Engineering*, Nise, 2007
5. Specific course information
 - a. catalog description

Introduction to the automatic control of aerospace and mechanical systems. Aero/Mech systems modeling, aircraft/spacecraft; computational analysis via MATLAB; frequency-domain techniques for analysis and synthesis; root-locus, Bode, Nyquist. Time and frequency-domain relationships. Mech/Aero System simulation.
 - b. prerequisites or co-requisites: Prereq: MAE 3401, MATH 313, and MATH 340
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction

Develop differential equations that describe the dynamic characteristics of systems (PR).
Determine the transfer function of a system.
Describe, utilizing the Laplace transform, the dynamic characteristics of systems. (PR)
Define open- and closed-loop.
Describe the meaning of sensitivity in control systems.
Identify, based on the Type of the open-loop system, the expected steady-state error of the closed-loop system.
Determine the conditions for stability of a feedback control system.
Sketch the Root Locus for a system by hand.
Design a feedback control system utilizing the Root Locus technique.
Describe the meaning of frequency domain dynamic system analysis.
Sketch a bode plot of a system by hand.
Sketch a polar plot of a system by hand.
Sketch a Nichols plot of a system by hand.
Sketch a Nyquist plot of a system by hand.
Describe the meaning of the phase margin and gain margin for a feedback control system.
Determine the phase and gain margins using each of the frequency domain plots listed above.
Design a feedback control system utilizing frequency domain design

techniques.

Design and implement a feedback control system.

- b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
- (a) An ability to apply knowledge of mathematics, science, and engineering.
 - (e) An ability to identify, formulate, and solve engineering problems.
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
 - (l) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
 - (m) Preparation to work professionally in both thermal and mechanical systems areas
7. Brief list of topics to be covered
- Review of modeling of dynamic systems
 - Review of dynamic system analysis
 - Feedback control system characteristics
 - Performance & stability of feedback systems
 - Introduction to the root locus
 - Designing control systems using root locus methods
 - Introduction to frequency response analysis
 - Design of control systems using frequency domain methods

MAE 4510/4511 Engineering Design I, II

1. Course number and name: MAE 4510/4511 Engineering Design I, II
2. Credits and contact hours: 2 and 3 credits respectively, 32 and 48 contact hours respectively
3. Instructor's name: Peter J. Gorder
4. Text book, title, author, and year: *Engineering Design*, Dieter, 1999
5. Specific course information
 - a. catalog description

Application of theory, design principles and experimental methods to a complete “real-world” design project involving design, analysis, fabrication and testing. Lecture and lab activities also include team dynamics, brainstorming, decision making, social/economic aspects of design, entrepreneurial aspects of design, and written/oral communication skills. Teams of students will solve both entrepreneurial and non-entrepreneurial design projects involving direct interaction with the project sponsors. 75 min. rec. per week during the first semester (1 cr. hr.) and six hours lab per week during the second semester (3 cr. hr.).
 - b. prerequisites or co-requisites: Prereqs: Senior standing or instructor approval.
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Be able to explain the need for a structured engineering design process and describe the steps in a typical engineering design process.
 - Be able to develop a comprehensive project plan for a typical engineering design project.
 - For a typical engineering design project, be able to identify customer requirements, rank these requirements, associate these requirements with engineering specifications and set targets for these specifications through the use of the Quality Function Deployment technique.
 - Be capable of performing a systematic process of generating, evaluating, selecting and prototyping design concepts for a typical mechanical engineering design project.
 - Be capable of performing a complete product development process based on results of Objectives 2-4.
 - Be capable of analyzing the economic aspects and impact of a proposed engineering design.
 - Be capable of analyzing the social impact of a proposed engineering design.
 - Be capable of working as a productive member of a diverse design team.
 - Be capable of communicating (written and verbal) individually and as part of a diverse design team in a professional manner.

- b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
- (a) An ability to apply knowledge of mathematics, science, and engineering
 - (b) An ability to design and conduct experiments, as well as to analyze and interpret data
 - (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
 - (d) An ability to function on multi-disciplinary teams
 - (e) An ability to identify, formulate, and solve engineering problems.
 - (f) An understanding of professional and ethical responsibility.
 - (g) An ability to communicate effectively.
 - (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
 - (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

7. Brief list of topics to be covered

- Project specific technical areas
- History and overview of the engineering design process
- Team dynamics
- Project planning and management
- Problem specification development
- Concept generation and evaluation
- Modeling and prototyping
- Economic decision-making
- Cost analysis
- Legal and ethical issues in design
- Communication in design

CHEM 1030 General Chemistry I

1. Course number and name_ Chem 1030 General Chemistry I
2. Credits and contact hours 5
3. Instructor's or course coordinator's name Dr. David J. Weiss
4. Text book, title, author, and year

Chemistry & Chemical Reactivity, 6th Ed, Vol 1; Kotz, Treichel, & Weaver; Thomson, 2006.

5. Specific course information
 - A. brief description of the content of the course (catalog description)

CHEM 1030-5. General Chemistry I. Lecture and Lab. A first college-level chemistry course for students with adequate high school chemistry. Emphasis on the structure and composition of matter: elements and compounds, atoms and molecules, and states of matter including solutions. Students having marginal mathematics backgrounds are advised to solidify their mathematics proficiencies before taking this course. Approved for LAS Natural Science requirement. Prer., one year high school chemistry and two years high school math.

B. prerequisites or co-requisites

Prer., one year high school chemistry and two years high school math.

6. Specific goals for the course, and/or specific outcomes of instruction, e.g., "*The student will be able to explain...*"

The student should understand the scientific method as well as understand and be able to explain how atoms and molecules are organized. In addition, students are expected to understand many chemical reactions, write the formulas and names of atoms and molecules, understand basic atomic structure and be able to draw molecules in the correct orientation. Among other topics, students learn how to predict energies involved in chemical reactions as well as understand fundamentals of gases, solutions and solids. Students learn to be active problem-solvers using a logical and methodical approaches to scientific problems. Students are also expected to learn to work with each other and to learn from each other in the course.

7. Brief list of topics to be covered

Understanding matter and its measurement

Molecules, ions and compounds

Chemical equations and stoichiometry

Reactions in aqueous solutions

Principles of reactivity

Atomic structure

Electronic configurations and periodicity

Bonding and structure
Hybridization and molecular orbital theory
Gases and their properties
Intermolecular forces, liquids and solids
Solutions and their Properties

1. CHEM 3010, MATERIALS SCIENCE

2. Credits: 3, Contact hours: 2.5 hr

3. Instructor: James G. Eberhart, Department of Chemistry

4. Required course notes: *The Materials Science Notebook*, by James G. Eberhart, 2011.

Optional textbook: *Foundations of Materials Science and Engineering*, by William F. Smith, 2006.

5. Specific course information:

a. The structure and properties of solids. Includes the study of the five classes of materials, namely, metals and alloys, ceramics and glasses, semiconductors, polymers, and composites.

b. Prerequisites: General Chemistry I, General Physics III, and Calculus I.

6. The student will be able to describe and/or calculate the atomic structure and properties of the five classes of materials including the quantum mechanics of metals and semiconductors as well as the interrelationships between the properties of solids.

7. Topics to be covered:

a. An overview of materials science and its history

b. A survey of metals, ceramics, plastics, and semiconductors.

c. Surfaces, interfaces, composite materials, and the joining of materials.

d. The crystal structure of metals and ceramics, density calculations, the calculation of bond energies and bond orders, and radius-ratio rules.

e. Polymer structure, names, bonding, molar mass, and stoichiometry.

f. Lattice mathematics; points, directions, and planes; Miller indices; mass and number density calculations.

h. Thermodynamics properties of solids, equations of state of solids, isobaric expansivity and isothermal compressibility, heat capacity of solids.

i. Mechanical properties of solids; stress, strain, and deformation of solids; Young's modulus and tensile strength; elastic and plastic deformation; Poisson's ratio and the bulk modulus; shearing and the shear modulus; and relationships between the various moduli.

j. Imperfections in solids: point, line, plane, and void defects; vacancies and interstitialcies; vacancies and diffusion; vacancy concentration and density calculations; and Schottki and Frenkel defects; nonstoichiometric compounds and the calculation of defect concentrations;

wüstite; mechanisms of electrical conduction; electron hopping in wüstite; edge, shear, and screw dislocations.

k. Surfaces and interfaces as imperfections, the equilibrium shape of small crystals, minimum free energy shapes, surface tension of various crystal structures and planes, capillarity-driven transport, surface and volume diffusion, scratch annealing and grain-boundary grooving, grain-boundary tension and grain-boundary groove angles, wetting and grain-boundary penetration by liquid metals, adhesion, the sintering of powders and the coalescence of gas voids, nuclear reactor fuels, polycrystalline solids and grain structure, crystallization of solids, and supercooling.

l. Overview of transport properties and materials science, the linear laws of irreversible thermodynamics, diffusion and Fick's laws, heat transfer and Fourier's laws, thermal conductivity, electrical conductivity and Ohm's law, and conductivity.

m. Diffusion in solids, calculation of diffusion profiles and times using Fick's second law, the use of the error function tables, alloy surface modification.

n. Electrical conductivity of metals, the band structure of metals, valence band, conduction band, the Fermi energy, the Fermi distribution law, electron mobility, and electron concentration, and electrical conductivity of metals.

o. Semiconductors and insulators; band structure, band gap, and electrical conductivity; intrinsic and extrinsic semiconductors; n-type and p-type semiconductors; the doping of semiconductors; electron and hole concentrations; and the electrical conductivity of semiconductors.

MATH 1350 Calculus I

1. Course number and name: MATH 1350 Calculus I
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Dr. George Rus
4. Text book, title, author, and year: *Essential Calculus, Early Transcendentals*, J. Stewart, 2007
5. Specific course information
 - a. catalog description

Selected topics in analytical geometry and calculus. Rates of change of functions, limits, derivatives of algebraic and transcendental functions, applications of derivatives, and integration.
 - b. prerequisites or co-requisites: Prereq: MATH 1050 or score 20 or more on the Algebra Placement Exam and score 10 or more on the Calculus Readiness Exam.
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Understand limits and the basis of derivatives
 - Perform differentiation and integration
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(I) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - Limits
 - Derivatives
 - Linear Approximations and Differentials
 - Exponentials, inverses and logs
 - Indeterminate Forms and L'Hopitals Rule
 - Mean Value Theorem
 - Derivatives and the Shapes of Graphs, 2nd Derivative test
 - Definite Integral
 - Evaluating Definite Integrals
 - Fundamental Theorem of Calculus
 - Substitution

MATH 1360 Calculus II

1. Course number and name: MATH 1360 Calculus II
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Dr. George Rus
4. Text book, title, author, and year: *Essential Calculus, Early Transcendentals*, J. Stewart, 2007
5. Specific course information
 - a. catalog description

Continuation of MATH 1350. Transcendental functions, techniques and applications of integration, Taylor's theorem, improper integrals, infinite series, analytic geometry, polar coordinates.
 - b. prerequisites or co-requisites: Prereq: MATH 1350
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Student will be able to apply techniques of integration to solve problems
 - Students will understand and use parametric equations
 - Students will be able to work in polar coordinates
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(I) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - applications of integration
 - techniques of integration
 - infinite sequences and series
 - parametric equations
 - conic sections and polar coordinates.

MATH 2350 Calculus III

1. Course number and name: MATH 2350 Calculus III
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Jenny Dorrington
4. Text book, title, author, and year: *Essential Calculus, Early Transcendentals*, J. Stewart, 2007
5. Specific course information
 - a. catalog description

Continuation of MATH 1360. Parametric curves, vector functions, partial differentiation, multiple integrals, Green's Theorem and Stoke's Theorem.
 - b. prerequisites or co-requisites: Prereq: MATH 1360
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - Students will be able to apply techniques of Calculus I and II to functions of two or more variables
 - Students will learn how to read and write about mathematics
 - Students will be able to understand theorems and write proofs
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(I) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - functions of two (or more) real variables
 - vectors and their properties
 - geometry of curves and surfaces in 3-D
 - theory of continuity, limits, derivatives, and integrals of functions of two or more variables
 - Green's Theorem, Stokes' Theorem, and the Divergence Theorem

MATH 3130 Introduction to Linear Algebra

1. Course number and name: MATH 3130 Introduction to Linear Algebra
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Dr. Radu Cascaval
4. Text book, title, author, and year: *Elementary Linear Algebra*, 10 ed., Howard Anton, 2010
5. Specific course information
 - a. catalog description

Systems of linear equations, matrices, vector spaces, linear independence, basis, dimension, determinants, linear transformations and matrices, eigenvalues and eigenvectors.
 - b. prerequisites or co-requisites: Prereq: MATH 1350
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - work with matrices to solve linear systems of equations
 - understand matrix algebra and matrix manipulation
 - solve for eigenvalues and eigenvectors
 - perform linear transformations
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(I) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - linear algebra
 - solving linear equations
 - vectors and vector spaces
 - orthogonality, determinants
 - eigenvalues and eigenvectors
 - linear transformations

MATH 3400 Introduction to Differential Equations

1. Course number and name: MATH 3400 Introduction to Differential Equations
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Dr. George Rus
4. Text book, title, author, and year: *Differential Equations and Their Applications - 4th Edition*, by M. Braun, 1993
5. Specific course information
 - a. catalog description
First order differential equations, linear differential equations, the Laplace transform method, power series solutions, numerical solutions, linear systems.
 - b. prerequisites or co-requisites: Prereq: MATH 2350
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - understand classification and solution techniques for differential equations
 - apply numerical methods to solving differential equations
 - solve linear systems of differential equations
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
(a) An ability to apply knowledge of mathematics, science, and engineering
(I) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - first order and second-order differential equations
 - numerical methods for solving differential equations
 - linear systems of differential equations.

MATH 3810 Introduction to Probability and Statistics

1. Course number and name: MATH 3810 Introduction to Probability and Statistics
2. Credits and contact hours: 3 credit hours, 48 contact hours
3. Instructor's name: Dr. Robert Carlson
4. Text book, title, author, and year: *Introduction to Probability*, Grinstead and Snell, 2006
5. Specific course information
 - a. catalog description

The axioms of probability and conditional probability will be studied as well as the development, applications and simulation of discrete and continuous probability distributions. Also, expectation, variance, correlation, sum and joint distributions of random variables will be studied. The Law of Large Numbers and the Central Limit Theorem will be developed. Applications to statistics will include regression, confidence intervals, and hypothesis testing.
 - b. prerequisites or co-requisites: Prereq: MATH 2350
 - c. required, elective, or selected elective course in the program: required
6. Specific goals for the course
 - a. specific outcomes of instruction
 - to extend and formalize knowledge of the theory of probability and random variables
 - to introduce new techniques for carrying out probability calculations and identifying probability distributions
 - to motivate the use of statistical inference in practical data analysis
 - to study elementary concepts and techniques in statistical methodology
 - b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

(a) An ability to apply knowledge of mathematics, science, and engineering
(I) An ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
7. Brief list of topics to be covered
 - Random variables and probability distributions
 - Mathematical expectation
 - Discrete probability distributions
 - Continuous probability distributions
 - Random sampling and sampling distributions
 - Estimation theory
 - Test of hypotheses

1. Course number and name
PES 1110 General Physics I
2. Credits and contact hours
4 Credits, 64 contact hours
3. Instructor's or course coordinator's name
Anatoliy Glushchenko
4. Text book, title, author, and year
Physics for Scientists and Engineers, by P.A. Tipler, G. Mosca, 6th edition, 2007
5. Specific course information
 - a. brief description of the content of the course (catalog description)
PES 1110-4. General Physics I. Rigorous calculus-level course in classical physics for science and engineering students. Includes measurements, vectors, motion in one dimension, motion in three dimensions, particle dynamics, work and energy, linear and angular momentum, rotation of rigid bodies, static equilibrium, oscillation, and gravity.
 - b. prerequisites or co-requisites
Coreq., MATH 1350.
6. Specific goals for the course, and/or specific outcomes of instruction, e.g., "*The student will be able to explain...*"
The goal of this course is to teach qualitative and quantitative thinking skills that can be applied in a broad variety of fields and circumstances, and to cultivate individual problem solving skills. The context for learning these skills is physics and, more specifically, measurements, vectors, motion in one dimension, motion in plane, particle dynamics, work and energy, momentum conservation, rotational dynamics, rigid bodies, oscillation, and gravitation.
This course addresses the following MAE program outcomes:
 - (a) an ability to apply knowledge of mathematics, science, and engineering
 - (l) an ability to apply principles of engineering, basic science, and mathematics
7. Brief list of topics to be covered
System of Measurements
Motion in One Dimension
Vectors, Motion in Two and Three Dimensions
Newton's Laws
Application of Newton's Laws
Work and Energy
Conservation of Energy
System of Particles and Conservation of Linear Momentum
Rotation

Conservation of Angular Momentum

Gravity

Static Equilibrium and Elasticity

Oscillations

1. Course number and name
PES 1120 General Physics II
2. Credits and contact hours
4 Credits, 64 contact hours
3. Instructor's or course coordinator's name
Tom Christensen
4. Text book, title, author, and year
Physics for Scientists and Engineers, by P.A. Tipler, G. Mosca, 6th edition, 2007
5. Specific course information
 - a. brief description of the content of the course (catalog description)
PES 1120-4. General Physics II. Topics covered include electrostatics, the electric field, Gauss's law, electric potential, capacitors and dielectrics, current and resistance, the magnetic field, Ampere's law, Faraday's law, inductance, oscillations, and electromagnetic waves.
 - b. prerequisites or co-requisites
Prer., PES 1110, Coreq., MATH 1360.
6. Specific goals for the course, and/or specific outcomes of instruction, e.g., "*The student will be able to explain...*"

This course examines introductory electricity and magnetism at a calculus-based level.

This course addresses the following MAE program outcomes:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (l) an ability to apply principles of engineering, basic science, and mathematics

7. Brief list of topics to be covered
 - I. Electric Forces, Fields and Potentials
 - Charges and Electric Fields
 - Forces and Fields from Coulomb's Law
 - Forces and Fields from Gauss's Law
 - Electric Potential
 - II. Applied Electronics
 - Capacitance
 - Current and Resistance
 - DC circuits and Kirchoff's Rules
 - III. Magnetic Forces and Fields
 - Magnetic Forces and Fields

Origins of Magnetic Fields

IV. Electricity and Magnetism - Induction

Faraday's Law and Lenz's Law

Inductances

V. Other topics

AC circuits

Electromagnetic Waves

Course Syllabus – CS1090

1. Introduction to Programming Using Matlab - CS1090
2. Hours: 3 credit hours
3. Instructor: Cheryl Schlittler
4. Textbook: MatLab: A Practical Introduction to Programming and Problem Solving
By: Stormy Attaway
2nd edition
5. Specific course information
 - a. The objective of this course is an introduction to programming with emphasis on structured programming techniques using MatLab as the learning environment. It is designed to teach mechanical and aerospace engineering students fundamentals of computer programming.
 - b. Prerequisites: High school algebra
6. Upon completion of the course the student will:
 - a. Be familiar with the MatLab environment.
 - b. Be able to write programs using the MatLab programming language.
 - c. Have an introduction to computer programming in general.
 - d. Have basic problem solving skills.
7. List of topics to be covered:
 - Introduction to computers and programming
 - Command line interaction with Matlab
 - Arrays
 - Mathematical and logical operations
 - Built-in Functions
 - Decision structures
 - Loop structures
 - MatLab Scripts
 - User-defined functions
 - Global/local variables
 - Strings
 - Input and output
 - Specialized arrays
 - File input and output
 - Sorting and searching
 - Plotting

Appendix B – Faculty Vitae

1. Name
Julie Albertson
2. Education – degree, discipline, institution, year
Ph.D. Mechanical Engineering, Washington State University, 1992
M.S. Mechanical Engineering, Washington State University, 1987
B.S. Mechanical Engineering, Washington State University, 1985
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
UCCS MAE Dept, Senior Instructor, 2007 – Present, full time
UCCS MAE Dept, Instructor, 2005 – 2007, full time
UCCS, EAS College and MAE Dept, Adjunct Instructor, 1995 – 2005, part time
USAF Academy, Aeronautics Dept, Associate Professor, 2000 – 2005, full time
USAF Academy, Aeronautics Dept, Technical Communications Director, 2000 – 2005, part time
USAF Academy, Aeronautics Dept, Assistant Professor, 1995 – 2000, full time
USAF Academy, Aeronautics Dept, Director of Faculty Development, 2000 – 2001, part time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
UCCS, Project Lead The Way Summer Training Institute Director, 2010 – Present, part time
UCCS, Colorado Affiliate Director, Project Lead The Way, 2005 – 2010, part time
Run PLTW Summer Training Institute for K-12 teachers from several states, instructing in engr. curriculum and techniques to attract students to STEM careers. Direct PLTW programs in Colorado, coordinating 38 K-12 schools for certification in program.
USAF Academy, Director, Aeronautics Laboratory, 1999 – 2000, part time
USAF Academy, Deputy Director, Aeronautics Laboratory, 1998 – 1999, part time
Managed a state-of-the-art \$120M engineering facility, including supervision, research, program, facility development and planning, contract management, as well as financial planning and budgeting for \$1.6M in research and operation and maintenance funds.
AFOSR/, Frank J. Seiler Research Laboratory, Research Director, Unsteady Aerodynamics, 1992 – 1995, full time
Directed and performed experimental research in unsteady aerodynamics and flow control
AFOSR/, Frank J. Seiler Research Laboratory, National Research Council Post-Doctoral Fellow, 1992, full time
Washington State University, Energy Conservation Engineer, 1986 – 1990, part time

Developed energy management plan for campus housing and support facilities.
Designed energy conservation retrofits, to include installation of energy management & control system.

5. Certifications or professional registrations
Engineering in Training (FE) 1985
6. Current membership in professional organizations
AIAA (Associate Fellow), SWE, AISES, ASEE
7. Honors and awards
2009 Instructional Technology Grant
2007 UCCS EAS Instructor of the Year
2006 UCCS EAS Technology and Service Award
2001 AIAA Sustained Service Award
2001, 2005 AIAA Special Service Citations, Precollege Outreach, VP Member Services, & Region V Director
2000, 1994 USAF Academy Civilian Woman of the Year
2000 UCCS MAE Honorarium Instructor of the Year
8. Service activities (within and outside of the institution)
2009 – 2010 UCCS High Impact Practices Working Group
2008 - Present UCCS Sustainability Council & Sustainability Minor Committee
2008 – Present UCCS EAS Women In Engineering Committee (current Chair)
2007 – Present UCCS Online Development Working Group
2006 – Present Coordinate MAE Student Advising Program
2006 – 2010 UCCS EAS High School Ambassador
2006 – 2010 AIAA Ombudsman
2005 – Present UCCS MAE Curriculum Committee Chair & EAS Curriculum Committee
2005 – Present UCCS EAS Student Affairs Committee
2002 – 2007 Member, AIAA Aerodynamics Measurements Technical Committee
2001 – 2005 AIAA Vice Pres., Member Services & Member, AIAA Board of Directors
2000 – 2003 *Aviation Week* Next Century of Flight Advisory Panel
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
“Teaching Thermodynamics I Online”, presented at the 2010 Online Development Summer Seminar Series, UCCS
10. Briefly list the most recent professional development activities
Instructional Writing Across the Curriculum Faculty Fellow 2010
Learning Community Faculty Development Grant 2008
Online Development & Assessment (Co-PI for a \$6500 grant)
Continued participation in the Teaching Online Development Working Group

1. Name
Michael L. Calvisi
2. Education – degree, discipline, institution, year
Ph.D. Applied Science & Technology, University of California, Berkeley, 2006
M.S. Applied Science & Technology, University of California, Berkeley, 2004
B.S. Mechanical Engineering, University of California, Berkeley, 1992
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
 - 1) University of Colorado at Colorado Springs, Assistant Professor, 2010 - present, full time
 - 2) Northwestern University, Post-Doctoral Fellow, 2008-2010, full time
 - 3) University of Birmingham, U.K., Post-Doctoral Research Fellow, 2007-2008, full time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
 - 1) SciVac Corp., Mechanical Engineer 2, Design and analysis of thin film deposition systems, 1996-2000, full time
 - 2) Lam Research Corp., Mechanical Engineer 2, Design and analysis of plasma etching equipment, 1993-1996, full time
 - 3) Lawrence Berkeley National Laboratory, Mechanical Engineering Assistant, Engineering analysis of scientific hardware, 1992-1993, part time
5. Certifications or professional registrations
Registered Professional Engineer, California
6. Current membership in professional organizations
American Physical Society
7. Honors and awards
 - 1) Outstanding Graduate Student Instructor, University of California, Berkeley, Department of Physics, 2004
8. Service activities (within and outside of the institution)
 - 1) MAE Curriculum Committee, 2010-Present
 - 2) Faculty Advisor, Historical Engineering Society, UCCS, 2010-Present
 - 3) MAE Faculty Search Committee, 2010
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

M.L. Calvisi, S. Davis and M. Miksis. 2010. "A mathematical model of intracranial saccular aneurysms: Evidence of hemodynamic instability," *Bulletin of the American Physical Society*, Vol. 55, No. 16, p. 407.

M. L. Calvisi. 2009. "Bubble energetics in cavitation driven by ultrasound and shock waves," COST Action D32 Final Meeting, *Chemistry in High-Energy Microenvironments*, Krakow University of Technology, Krakow, Poland, March 29 - April 1, 2009.

M.L. Calvisi, J.I. Iloreta and A.J. Szeri. 2008. "Dynamics of bubbles near a rigid surface subjected to a lithotripter shock wave. Part 2. Reflected shock intensifies nonspherical cavitation collapse," *J. Fluid Mechanics*, Vol. 616, pp. 63-97.

E. Klaseboer, S.W. Fong, C.K. Turangan, B.C. Khoo, A.J. Szeri, M.L. Calvisi, G.N. Sankin and P. Zhong. 2007. "Interaction of lithotripter shockwaves with single inertial cavitation bubbles," *J. Fluid Mechanics*, Vol. 593, pp. 33-56.

M.L. Calvisi, O. Lindau, J.R. Blake and A.J. Szeri. 2007. "Shape stability and violent collapse of microbubbles in acoustic traveling waves," *Physics of Fluids*, Vol. 19, No. 4, 047101.

10. Briefly list the most recent professional development activities

- 1) Attended 63rd Annual Meeting of the American Physical Society's Division of Fluid Dynamics, Long Beach, CA, November 21-23, 2010
- 2) Attended Symposium of the Colorado Initiative in Molecular Biotechnology, Boulder, CO, November 18, 2010
- 3) Attended "Tenure Nuts and Bolts" Workshop, UCCS, October 7, 2010
- 4) Attended Teaching Workshop, UCCS, September 2, 2010

1. Name
Peter J. Gorder
2. Education – degree, discipline, institution, year
Ph.D., Mechanical and Aeronautical Engineering, University of California, Davis.
September 1993.
M.S., Mechanical and Aeronautical Engineering, University of California, Davis, March
1988.
B.S., Mechanical Engineering and B.S. Aeronautical Engineering, University of
California, Davis, March 1986.
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate),
when (ex. 1990-1995), full time or part time
University of Colorado at Colorado Springs, Department of Mechanical and Aerospace
Engineering, Associate Professor, 9/06-present, full time
University of Colorado at Colorado Springs, College of Engineering and Applied
Science, Associate Dean, 7/05-9/06, full time
Space, Network Information and Space Security Center, University of Colorado at
Colorado Springs, Deputy Director & Faculty Research Associate, 7/04-6/05, full
time
University of Colorado at Colorado Springs, Department of Mechanical and Aerospace
Engineering, Chair and Associate Professor, 7/00-6/04, full time
Kansas State University, Department of Mechanical and Nuclear Engineering, Associate
Professor, 8/97-7/00, full time
Kansas State University, Department of Mechanical and Nuclear Engineering, Assistant
Professor, 8/93-8/97, full time
4. Non-academic experience – company or entity, title, brief description of position, when
(ex. 1993-1999), full time or part time
Analytical, Systems Technology, Inc., Staff Engineer, 1/88-7/93, full time
5. Certifications or professional registrations
none
6. Current membership in professional organizations
Member, American Institute of Aeronautics and Astronautics.
Member, American Society of Mechanical Engineers.
Member, Institute of Electrical and Electronics Engineers
7. Honors and awards
none
8. Service activities (within and outside of the institution)
none

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
- Gorder, Peter J, “Trajectory Tracking as a Means of Flight Control Decoupling,”
Published in the proceedings of the 2003 IASTED Annual International
Conference on Modeling, Identification, and Control, Innsbruck, Austria, Feb 10-
13, 2003.
- Gorder, Peter J., Kevin B. Lease, and Sherri Auld, “Facilitating the Transition from
Engineering Student to Professional Engineer Through an Interdisciplinary
Capstone Design Course,” Proceedings of the 2001 American Society for
Engineering Education Annual Conference & Exposition, Albuquerque, NM,
June 24-27, 2001.
- Thompson, J. Garth, Peter J. Gorder, and Hosam K. Fathy, “A Uniform Mathematical
Basis for Aircraft Navigation and Control,” SAE World Aviation Congress and
Exposition, San Francisco, CA, Oct. 19-21, 1999.
10. Briefly list the most recent professional development activities
none

1. Name
Andrew D. Ketsdever
2. Education – degree, discipline, institution, year
Ph.D. Aerospace Engineering, USC, 1995
M.S. Aerospace Engineering, USC, 1992
B.S. Aerospace Engineering, USC, 1990
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time

Fall 2011 – present: Associate Professor, University of Colorado at Colorado Springs, Colorado Springs, CO, Department of Mechanical and Aerospace Engineering (FT)

Spring 2008-Spring 2011: Assistant Professor, University of Colorado at Colorado Springs, Colorado Springs, CO, Department of Mechanical and Aerospace Engineering (FT)

Fall 2004-Spring 2007: Visiting Professor, United States Air Force Academy, Colorado Springs, CO, Department of Astronautics (FT)

Fall 2000-Fall 2004: Research Assistant Professor, University of Southern California, Los Angeles, CA, Department of Aerospace and Mechanical Engineering (PT)

Spring 1996-Fall 1999: Lecturer, University of Southern California, Los Angeles, CA, Department of Aerospace Engineering (PT)
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
1992-2008: Air Force Research Laboratory, Edwards AFB, CA
Research in Advanced Propulsion Concepts relating to satellite propulsion, near-space vehicles, hypersonics, and launch systems. Investigating breakthrough physics and emerging technology that can play a role in Department of Defense systems for the next 50 years. (FT)
5. Certifications or professional registrations
6. Current membership in professional organizations
AIAA, ASEE, AVS
7. Honors and awards
Elected Associate Fellow, American Inst. of Aeronautics and Astronautics, 2008
Elected to International Adv. Cmte., Rarefied Gas Dynamics Symposium, 2008
Nominated as Educator of the Year, US Air Force Research Laboratory, AFRL/RZ candidate (competed at AFMC level)

Honored Lifetime Member, Madison's Who's Who, 2008
Engineer of the Year, AIAA, Rocky Mountain Section, 2006
Roger R. Bate Award for Outstanding First-Year Instructor in Astronautics, US
Air Force Academy, Department of Astronautics, 2005
Scientist of the Year, Air Force Research Laboratory, Prop. Directorate, 2002

8. Service activities (within and outside of the institution)

CU System Educational Policy and University Standards Committee (2010-present)
UCCS Educational Policy and University Standards Committee (2008-present)
UCCS Faculty Assembly (elected 2008-2009 and re-elected 2009-2010)
EAS Dean's Research Forum, Steering Committee (2010-present)
EAS PhD Program Assessment Committee, Chair (2010-present)
EAS Undergraduate Research Scholars Program, Coordinator (2010-present)
Provost's Task Force on High Impact Practices (2009-2010)
Faculty Research Council (Vice Chancellor of Research and Innovation) (2008-present)

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

N. Gimelshein, S. Gimelshein, A. Ketsdever, and N. Selden, "Impact of Vane Size and Separation on Radiometric Forces for Microactuation," J. Appl. Phys., Vol. 109, 074506, 2011.

C. Ngalande and A. Ketsdever, "A Unique Cryogenic Pumping Array for Low Sticking Coefficient Gas Flows," J. Vac. Sci. Technol. A, Vol. 28, No. 6, pp. 1356-1362, 2010.

B. Cornella, A. Ketsdever, N. Gimelshein, and S. Gimelshein, "Thrust Augmentation of Solid Rocket Motors Using Beamed Microwave Energy," J. Propulsion and Power, Vol. 26, No. 5, pp. 1016-1024, 2010.

N. Gimelshein, S. Gimelshein, N. Selden, and A. Ketsdever, "Modeling of Low-Speed Rarefied Gas Flows Using a Combined ES-BGK/DSMC Approach," Vacuum, Vol. 85, No. 2, pp. 115-119, 2010.

10. Briefly list the most recent professional development activities

IEEE Aerospace Conference, Big Sky, MT, March 2011
27th International Symposium on Gas Dynamics, Pacific Grove, CA, July 2010
10th Thermophysics and Heat Transfer Conference, Chicago, IL, June 2010
57th JANNAF Meeting, Colorado Springs, CO, May 2010

1. Name
Michael C. Larson
2. Education – degree, discipline, institution, year
Ph.D. Mechanical Engineering, MIT, 1992
M.S. Mechanical Engineering, University of Michigan, 1985
B.S. Mechanical Engineering, Tulane University, 1984
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
University of Colorado at Colorado Springs, Professor, El Pomar Chair of Engineering and Innovation, 2006 - present, full time
Tulane University, Associate Professor, 1998-2006, full time
Tulane University, Assistant Professor, 1992-1998, full time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
University of Colorado at Colorado Springs, Associate Vice Chancellor for Research, 2008-present, full time
TRW Corporation, Visiting Scientist, Conducted research in advanced surface mount technology for electronic packages while on sabbatical from Tulane, 2000
Union College, Visiting Professor in the Department of Mechanical Engineering while on sabbatical from Tulane, 1999
U.S. Air Force, Mechanical Engineer, Performed damage tolerance analyses and finite element analyses of aircraft structural components, 1985-1988
5. Certifications or professional registrations
none
6. Current membership in professional organizations
ASME, SPIE
7. Honors and awards
UCCS Chairperson’s Award, Colorado Springs Economic Development Corporation, 2010.
Outstanding Researcher of the Year, School of Engineering, University of Colorado at Colorado Springs, 2008
New Inventor of the Year 2007, awarded by the University of Colorado Technology Transfer Office
Innovator of the Year 2005, awarded by New Orleans City Business for establishing and directing the Studio for Creative Design
Society of Tulane Engineers and the Lee H. Johnson Award for Teaching Excellence, Tulane University, 1999

Air Force Commendation Medal

8. Service activities (within and outside of the institution)

Director and creator of MIND Studios, a full-service product design and development studio housed within the University of Colorado at Colorado Springs.

Board Member, Colorado Youth Symphony Association, 2010-present.

Colorado Springs “What If”, Innovation Festival Planning Committee, 2009.

Career Day presenter at Explorer Elementary, October 2009 and October 2010.

Celebrate Youth in the Arts, invited speaker, June 2009.

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

“Design of a nasal septum measurement device and evaluation of septoplasty efficacy,” Luke Hooper, Valmiki K. Sooklal, Michael C. Larson and Jesse McClure, to appear *ASME Journal of Medical Devices*.

“Use of a Finite Element/Cohesive Zone Hybrid Method for Predicting the Failure of Structural Panels Irradiated by a Laser Source,” Valmiki K. Sooklal, Michael Larson and Jesse McClure, *Journal of Directed Energy*, vol. 3, no. 4, 2010.

Valmiki Sooklal, Jesse McClure, Luke Hooper, Michael Larson, “A laser device for fusion of nasal mucosa,” *Photonic Therapeutics and Diagnostics VI Proceedings of SPIE*, vol. 7548 Photonics West, March 2010.

“Laser Fusion of Biological Materials”, M. Larson, J. McClure and L. Hooper, *Proceedings of the Biotechnology and Bioinformatics Symposium*, Colorado Springs, CO, October 2007.

“Failure initiation sites in tensioned aluminum panels subject to IR irradiation”, J. McClure and M.C. Larson, *Journal of Directed Energy*, 2, [1], pp. 59-70, 2006.

“Experimental Study and Life Prediction on High Cycle Vibration Fatigue in BGA packages”, X. Liu, V. K. Sooklal, M.A. Verges, and M.C. Larson, *Microelectronics Reliability*. 46, [7], pp. 1128-1138, 2006.

“Residual Compression in Area Array Packages Induced by Underfill Shrinkage,” M.C. Larson, M.A. Verges and X. Liu, *Microelectronics Reliability*, 46, [2-4], pp. 496-502, 2006.

10. Briefly list the most recent professional development activities

Attended SPIE Photonics West, January, 2010

Attended the Design of Medical Devices Conference, University of Minnesota, April 2009

1. Name
Leal Kenny Lauderbaugh
2. Education – degree, discipline, institution, year
Ph.D., Mechanical Engineering, University of Michigan, Ann Arbor, MI, 1985
M.S., Mechanical Engineering, University of Michigan, Ann Arbor, MI, 1982
B.S., Mechanical Engineering University of Michigan, Ann Arbor, MI, 1981
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
University of Colorado at Colorado Springs, Department of Mechanical and Aerospace Engineering, Associate Professor, 2001-present, full time
Penn State University-Erie, Mechanical Engineering Faculty Assistant Professor, 1997-2001, full-time
Rensselaer Polytechnic Institute, Department of Mechanical Engineering, Aeronautical Engineering and Mechanics, Assistant Professor, 1985-1992, full time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
Andover Controls Corporation, Product Marketing Manager:Product Development 1996-1997, full time
Saunders Associates, Executive Director, 1992-1996, full time
Federal Mogul Corp., Engineer, Manufacturing Research, 1981-1982, full time
5. Certifications or professional registrations
none
6. Current membership in professional organizations
American Society of Mechanical Engineers, ASME
7. Honors and awards
none
8. Service activities (within and outside of the institution)
Graduate Affairs Committee, Chair, 2001 – 2004
Executive Committee, Chair, 2003 – 2004
Curriculum Committee, 2001 – 2004
Promotion and Tenure Committee, 2001 – present
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
“Analysis of the Effects of Process Parameters on Exit Burrs in Drilling,” by L. Ken Lauderbaugh, Journal of Materials Processing Technology, 2007.

“House of Quality Based Assessment of Business Skills Required by Manufacturing Engineering Graduates,” by L. Ken Lauderbaugh Saunders and Joan G. Saunders, ASME International Journal of Engineering Education, Vol. 20, No. 5, 2004, 777-786.

10. Briefly list the most recent professional development activities
none

1. Name
James W. Stevens
2. Education – degree, discipline, institution, year
Ph.D. Mechanical Engineering, Brigham Young University, 1991
M.S. Mechanical Engineering, BYU, 1988
B.S. Mechanical Engineering, BYU, 1987
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
University of Colorado at Colorado Springs, Professor, Chair, 2006 - present, full time
University of Colorado at Colorado Springs, Associate Professor, 2002-2006, full time
Mississippi State University, Associate Professor, 1995-2002, full time
Mississippi State University, Assistant Professor, 1991-1995, full time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
Argonne National Laboratory-West, DOE Faculty Participation Program, summer 1992, full time
5. Certifications or professional registrations
Registered Professional Engineer, Colorado
6. Current membership in professional organizations
ASME
7. Honors and awards
UCCS College of Engineering and Applied Science Outstanding Teacher of the Year, 2006
8. Service activities (within and outside of the institution)
Department Chair 2006-present
Dean's Search Committee 2008-2009 AY
Member of ASME Performance Test Codes Committee 19.3 Temperature Measurement
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
M. R. Maixner, J.W. Stevens, 2009, "Assessment of Near-Surface Ground Temperature Profiles for Optimal Placement of a Thermoelectric Device," Energy Conversion and Management, Vol 50, pp. 2361-2365.

D. K. Schmidt, J. Stevens, J. Roney, 2007, "Near-Space Station-Keeping Performance Of A Large High-Altitude Notional Airship," J. of Aircraft, Vol 44, n.2, pp. 611-615.

M. Roberts, J.W. Stevens and R. Luck, 2007, "Evaluation of Parameter Effects in Estimating Non-linear Uncertainty Propagation," J. of the Int. Measurement Confederation, Vol 40, n. 1, pp. 15-20.

J.W. Stevens, 2010, "Low Capital Cost Renewable Energy Conversion With Liquid Piston Stirling Engines," Proceedings of ASME 2010 4th International Conference on Energy Sustainability ES2010, Phoenix, Arizona, USA, May 17-22, 2010, paper ES2010-90129.

J.W. Stevens, 2007, "Design and Test of a Thermoelectric Ground-source Heat Engine," Proceedings of the 2007 ASME International Mechanical Engineering Congress and Exposition, Seattle, Washington, Nov. 11-15, 2007, paper IMECE2007-41458.

D. K. Schmidt, J. Stevens, J. Roney, 2006, "Near-Space Station Keeping Performance Of A Large High-Altitude Notional Airship," Proceedings of the AIAA Atmospheric Flight Mechanics Conference, Keystone, CO, 21 - 24 Aug 2006.

10. Briefly list the most recent professional development activities
Attended 4th International Conference on Energy Sustainability, Phoenix AZ, May 17-22, 2010

1. Name
Valmiki K. Sooklal
2. Education – degree, discipline, institution, year
Ph.D Mechanical Engineering, Tulane University, 2007
M.S. Mechanical Engineering, Tulane University, 2002
B.S. Mechanical Engineering, University of the West Indies, 1994
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
University of Colorado at Colorado Springs, Instructor, 2008-present, full time
University of South Alabama, Visiting Assistant Professor, 2007-2008, full time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
Water and Sewerage Authority of Trinidad and Tobago, Engineer I, Project Implementation Unit involved in project assessment and supervision of IBRD funded projects, 1996-1999, full time
5. Certifications or professional registrations
None
6. Current membership in professional organizations
SPIE
7. Honors and awards
None
8. Service activities (within and outside of the institution)
None
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication

Valmiki K. Sooklal, Luke Hooper and Michael C. Larson, “Design of a Nasal Septum Measurement Device,” ASME Journal of Medical Devices (Accepted May 2011)

Valmiki K. Sooklal, Michael Larson, Jesse McClure, “Use of a Finite Element/Cohesive Zone Hybrid Method for Predicting the Failure of Structural Panels Irradiated by a Laser Source,” Journal of Directed Energy Vol. 3, Number 4 (Summer 2010)

Valmiki Sooklal, Jesse McClure, Luke Hooper, Michael Larson, “A laser device for fusion of nasal mucosa,” Proceeding of SPIE, Vol. 7548 (March 2010)

10. Briefly list the most recent professional development activities
none

1. Name
Steven G. Tragesser
2. Education – degree, discipline, institution, year
Ph.D. Aerospace Engineering, Purdue University, 1997
M.S. Aerospace Engineering, Purdue University, 1994
B.S. Aerospace Engineering, University of Illinois, 1992
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
University of Colorado at Colorado Springs, Associate Professor, 2010 - present, full time
University of Colorado at Colorado Springs, Assistant Professor, 2004-2010, full time
Air Force Institute of Technology, Assistant Professor, Space Systems Coordinator, 1999-2004, full time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
C.S. Draper Laboratory, Technical Staff, Space Guidance and Navigation Section, 1998-1999, full time
5. Certifications or professional registrations
None
6. Current membership in professional organizations
AIAA
7. Honors and awards
UCCS Engineering and Applied Science Researcher of the Year, 2007
Young Researcher of the Year for the AIAA Rocky Mountain Section, 2004
8. Service activities (within and outside of the institution)
MAE Graduate Committee Co-Chair
Chair of MAE Awards Cmt
UCCS Gen Ed Task Force
Member of AIAA Tether Technical Cmt
Reviewer for Journal of Guidance, Control and Dynamics
Reviewer for Journal of Guidance Spacecraft and Rockets
Director for UCCS Affiliate of the Colorado Space Grant Consortium
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

Slane, J. and Tragesser, S., “Analysis of Periodic Nonautonomous, Inhomogeneous Systems,” accepted for publication in *Nonlinear Dynamics and Systems Theory*.

Tragesser, S. G. and Gorjidoz, B., “Open-Loop Spinup and Deployment Control of a Tether Sling,” *Journal of Spacecraft and Rockets*, Vol. 47, No. 2, 2010, pp. 345-352.

Tragesser, S., “Static Formations Using Momentum Exchange Between Satellites,” *Journal of Guidance, Control and Dynamics*, Vol. 32, No. 4, 2009, pp. 1277-1286.

Tragesser, S. and Faulstich, M., “Tethered Satellite Identification with Mixed Observation Data,” *Journal of Spacecraft and Rockets*, Vol. 44, No. 1, 2007.

10. Briefly list the most recent professional development activities

Attended AIAA Space 2010 Conference, Anaheim, CA, Aug. 2010.

Attended AIAA Space 2009 Conference, Pasadena, CA, Sept. 2009.

Attended AIAA/AAS Guidance, Navigation and Control Conference, Chicago, IL, Aug. 2009.

Attended AAS/AIAA Spaceflight Mechanics, Savannah, GA, Feb. 2009.

Attended AIAA/AAS Astrodynamics Specialist Conf., Honolulu, HI, Aug. 2008.

Attended AAS/AIAA Spaceflight Mechanics, Galveston, TX, Feb. 2008.

1. Name
Rebecca Webb

2. Education – degree, discipline, institution, year

Ph.D.	Mechanical Engineering	Oregon State University	2002 -2005
M.S.	Mechanical Engineering	Pennsylvania State University	1998 -2000
B.S.	Mechanical Engineering	University of Rhode Island	1994 -1998

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

Assistant Professor	University of Colorado at CO Springs	2007 - present
Adjunct Professor	University of Colorado at CO Springs	2006

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

Senior Engineer	Directed Energy Solutions	2006 -2007
<ul style="list-style-type: none"> • Designed components and oversaw the overall mechanical design of solid state lasers • Performed thermal analysis of laser cooling techniques 		
R & D Engineer	Agilent Technologies	2000 -2002
<ul style="list-style-type: none"> • Brought an oscilloscope active probe design into production • Lead designer of the 7 GHz bandwidth active oscilloscope InfiniiMax Probe differential browser. This probing system was winner of the EDN “Innovation of the Year Award” 		

5. Certifications or professional registrations

6. Current membership in professional organizations
Member of the American Society of Mechanical Engineers

7. Honors and awards
College of Engineering and Applied Science Teacher of the Year 2009

8. Service activities (within and outside of the institution)

UCCS Faculty Assembly	Present
MAE Graduate Committee – Co-Chair	2007 - present
MAE Lab Committee	2007 – 2009
MAE Faculty Search Committee	2007 - present
SAE BAJA Car Project - Advisor	2009 - present
MAE website maintenance	2008 - present
K-12 Outreach: El Pomar Multicultural Youth Leadership Initiative Demonstrations	
Multicultural office for Student Access, Inclusiveness, and	2008 - present

Community Mentor
MAE Graduate School Seminar Presentation
ASME Heat Transfer Conference - reviewer
Journal of Fluids Engineering - reviewer
Journal of Spacecraft and Rockets - reviewer

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
 - Horvath, J.A. and R.N. Webb, “Radiative Heat Transfer of a Microstructured Surface” *International Communications in Heat and Mass Transfer*, submitted August 2010.
 - Horvath, J.A. and R.N. Webb, “Experimental Study of Radiation Absorption by Microchannels of Varying Aspect Ratios” *Solar Energy Journal*, submitted July 2010.
 - Webb, R.N. and J.F. Halpert, “Single-Phase Liquid Nitrogen Flow in a Parallel Microchannel Array,” *Heat Transfer Engineering*, submitted June 2010.
 - Cullion R., Pence, D.V., Liburdy, J.A., Narayanan, V., 2007, Void Fraction Variations in a Fractal-Like Branching Microchannel Network, *Heat Transfer Engineering*, v 28, n 10, p 806-816.

10. Briefly list the most recent professional development activities
 - iWAC Workshop – participated in a semester long writing across the curriculum workshop in an effort to better incorporate writing in engineering classes
 - Advanced Space Propulsion Workshop

1. Name
Jason Clifford
2. Education – degree, discipline, institution, year
Master of Engineering, Engineering Management and Space Operations,
University of Colorado at Colorado Springs, 2007
Bachelors of Science, Mechanical Engineering w/ aerospace minor, University of
Colorado at Colorado Springs, 2006
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate),
when (ex. 1990-1995), full time or part time
UCCS adjunct/Lecturer for;
MAE 1502 (principles of Engineering) Fall 2007 to present
MAE 1503 (Intro to Engineering Design) Spring 2008 to present
MAE 2055 (Mechtronics I) Fall 2008 – Fall 2009
4. Non-academic experience – company or entity, title, brief description of position, when
(ex. 1993-1999), full time or part time
Ingersoll Rand, New Product Engineering – Design and implementation of new
products involving multiple; countries, material processes and regulatory agencies
with heavy work on patent and patentable designs, 2007 to present
CRR Labs, Shipping Manager for specialty blood laboratory, 2003-2007
5. Certifications or professional registrations
DFSS Green Belt, Advanced GD&T
6. Current membership in professional organizations
ASAE, SME

1. Name
Russell M. Cummings
2. Education – degree, discipline, institution, year
Ph.D., Aerospace Engineering, University of Southern California, 1988
E.A.E., Aerospace Engineering, University of Southern California, 1982
M. Engr., Aeronautical Engineering, Calif. Polytechnic State Univ., 1985
B.S., Aeronautical Engineering, Calif. Polytechnic State Univ., 1977
B.A., Music, Calif. Polytechnic State Univ., 1999
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
University of Colorado, Colorado Springs, MAE Department, Lecturer, 2006-present, part time
U.S. Air Force Academy, Department of Aeronautics, Professor, 2004-present
Calif. Polytechnic State Univ., Aeronautical Engineering Department, Professor Emeritus, 2004-present; Chairman, 1992-1995; Professor, 1991-2004; Associate Professor, 1986-1991
Oxford University Computing Laboratory, Numerical Analysis Group, Visiting Academic, 1995
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
NASA Ames Research Center, Applied Computational Fluids Branch, National Research Council Associate, 1988-1990, full time
Hughes Aircraft Company, Missile Systems Group, Member of the Technical Staff, 1979-1986, full time
5. Certifications or professional registrations
None
6. Current membership in professional organizations
AIAA, Tau Beta Pi, Sigma Xi
7. Honors and awards
USAF Frank J. Seiler Research Award, 2009
USAF Award for Innovative Excellence in Teaching, Learning, and Technology, 2009
AIAA Sustained Service Award, 2003
U.S. Air Force Science and Engineering Award, 2002
Boeing - A. D. Welliver Faculty Summer Fellow, 2000
Litton Excellence in Research and Development Award, 2000
TRW Excellence in Teaching Award, 1999
BFGoodrich Collegiate Inventors Program, Undergraduate Advisor Award, 1998
Northrop Grumman Excellence in Teaching and Applied Research Award, 1995
AIAA National Faculty Advisor Award, 1994

NASA Group Achievement Awards, 1989, 1990

8. Service activities (within and outside of the institution)
 - Associate Editor for *Journal of Spacecraft and Rockets*
 - Associate Editor for *Aerospace Science and Technology*
 - Co-chairman NATO RTO Task Group
 - Past Chairman and current member, AIAA Student Activities Committee
 - Member, AIAA Fluid Dynamics Technical Committee
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

J.J. Bertin and R.M. Cummings, "Critical Hypersonic Aerothermodynamic Phenomena," *Annual Review of Fluid Mechanics*, Palo Alto, CA: Annual Reviews, Inc., Vol. 38, 2006, pp. 129-157.

R.M. Cummings and S.A. Morton, "Continuing Evolution of Aerodynamic Concept Development Using Collaborative Numerical and Experimental Evaluations," *Journal of Aerospace Engineering*, Vol. 220, No. 6, 2006, pp. 545-557.

R.M. Cummings and S.A. Morton, "Computational Aerodynamics Goes To School: A Course in CFD for Undergraduate Students," *Computers in Education Journal*, Vol. 17, No. 3, 2007, pp. 48-57.

R.M. Cummings, S.A. Morton, and S.G. Siegel, "Numerical Prediction and Wind Tunnel Experiment for a Pitching Unmanned Combat Air Vehicle," *Aerospace Science and Technology*, Vol. 12, 2008, pp. 355-364.

R.M. Cummings, S.A. Morton, and D.R. McDaniel, "Experiences in Accurately Predicting Time-Dependent Flows," *Progress in Aerospace Sciences*, Vol. 44, No. 4, 2008, pp. 241-257.

J.J. Bertin and R.M. Cummings, *Aerodynamics for Engineers*, 5th Edition, Upper Saddle River, NJ: Prentice Hall, 2008.

T.L. Jeans, D.R. McDaniel, R.M. Cummings, and W.H. Mason, "Aerodynamic Analysis of a Generic Fighter Using Delayed Detached-Eddy Simulation," *Journal of Aircraft*, Vol. 46, No. 4, 2009, pp. 1326-1339.

10. Briefly list the most recent professional development activities
 - Attended 49th AIAA Aerospace Sciences Meeting, Orlando FL, January, 2010

1. Name
Robert G. Gist
2. Education – degree, discipline, institution, year
M.S., Aerospace Engineering, University of Texas, Austin, 1991
B.S., Mathematics and Physics (double major), West Texas A&M Univ., 1987
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
UCCS, Instructor – Mechanical & Aerospace Engineering
2003 - present, part time
UCCS, Senior Instructor – Physics & Energy Sciences
2003 - present, full time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
1 Earth Research, LLC, Managing Partner, space operations support
2003-2007, full time
The Aerospace Corporation, Project Engineer, space operations support
2000-2003, full time
The Aerospace Corporation, Eng. Specialist, astrodynamics & orbit analysis
1992-2000, full time
NOAA, Orbit Determination Specialist
1991-1992, full time
5. Certifications or professional registrations
(none)
6. Current membership in professional organizations
(no recent membership)
7. Honors and awards
UCCS College of Engineering and Applied Science Outstanding Part-Time
Instructor of the Year, 2006
8. Service activities (within and outside of the institution)
Judge – FIRST Lego League, 2006-present
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
(no recent publications)
10. Briefly list the most recent professional development activities
Graduate studies toward Ph.D. of Applied Science in Physics, UCCS (current)

1. Name

Lianne Miller

2. Education

MS, Mechanical Engineering, Michigan Technological University, 2006

BS, Biomedical Engineering, Michigan Technological University, 2004

3. Academic experience

University of Colorado at Colorado Springs, Adjunct Lecturer, Fall 2010 – Present, Part-Time

4. Non-academic experience

USA Cycling, National Team Camp Mountain Bike Coach. Taught riding skills to national and international level junior racers. 2008-Present, Part-Time (concurrent with full-time work listed below)

Ingersoll-Rand, Test Engineer. Designed test protocols, oversaw a small group of test technicians, and reported on test outcomes, 2007-2010, Full Time

Empirical Testing Corp, Test Engineer. Designed, performed, and reported outcomes of mechanical tests. 2006-2007, Full-Time

Michigan Scientific Corporation, R&D Engineer. Interned my way through all engineering and some finance aspects of the company and hired into a design position. 1999-2006, Part-Time to Full-Time

5. Certifications or professional registrations

None.

6. Current membership in professional organizations

None.

7. Honors and awards

None

8. Service activities

Active member of USA Cycling in trail building and women's mountain biking outreach.

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

“Bioactive Glasses and Essential Trace Elements in Angiogenesis during Skin Regeneration in an In-Vivo Model” BMES Fall Meeting, Baltimore MD, September 2005

10. Briefly list the most recent professional development activities

Reading, collaborating with fellow lecturers, and experimenting with different teaching techniques to improve my lectures. Notably, bringing some of the motivational psychology from coaching cycling over to the classroom.

1. Name
Fred H. Porter III
2. Education – degree, discipline, institution, year
BSES USAF Academy 1960
MSEE Air Force Institute of Technology (AFIT) 1973, Thesis "1 KEV Ion Probe for Thin Film Analysis.", Integrated circuit technology.
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full or part time

USAF Academy, Dept of Aeronautics, Researcher Plasma Flight Controls 2-meter span RC aircraft, Instructor, Assistant Professor, Associate Professor, 1976-1980, 2004-present, Full Time

University of Colorado at Colorado Springs, Dept of Mechanical and Aerospace Engineering, Lecturer, 2007-present, Part Time

Colorado Technical University Colorado Springs, Dept of Comp Science, Adjunct Associate Professor, C++, UNIX, Java Programming Language, 1999-present, Part Time

Webster University Colorado Springs, Computer Science, Instructor, 1981-1982, Part Time

USAF Test Pilot School, Chief of Academics, Performance Flight Testing, 1973-1975
USAF Flight Instructor, Moody AFB Georgia, 1961-1966
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
Porter Data Systems, Inc VP Engineering and Design, 1976-2010, designed over 50 measurement systems linking sensors to data acquisition systems for production lines and R&D laboratories, Gates Rubber Company, Eastman Kodak Company, Oil and Gas Industry, Full time, detailed list of 57 designs available on request.
USAF Edwards AFB, Flight Test Center, test pilot and test engineer, system development on U-2, F-104, Kestrel, and other.
USAF one-year tour in Da Nang Viet Nam, 70 Combat missions, 1966-1967
5. Certifications or professional registrations
PE #15046, State of Colorado
6. Current membership in professional organizations
AIAA
Society of Experimental Test Pilots
7. Honors and awards

AFIT Commandant's Award for Outstanding Thesis Research, 1971-1973
USAF Medals, Bronze Star, Purple Heart

8. Service activities (within and outside of the institution)
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
10. Briefly list the most recent professional development activities
Numerous professional courses on line and on ground presented at USAF Academy, Colorado Technical University, and the University of Colorado at Colorado Springs. Some certificates of completion available on request.

1. Name
Gary L. Reynolds
2. Education – degree, discipline, institution, year
B.S. Engineering Science, Iowa State University, 1972
M.S. Mechanical Engineering, Iowa State University, 1979
3. Academic Experience:
Iowa State University, Teaching Assistant, 1970's, Part time
Iowa State University, Instructor, 1980's, Part time
University of Colorado Colorado Springs, 2011, Part time
4. Non-academic Experience:
Executive Director of Facilities Services (Fulltime: Dec 2007 to present)
University of Colorado Colorado Springs
Responsibilities: Oversight of the operations, maintenance, capital construction and utility systems for the college. Direct duties include staff leadership, oversight of the department's budget and capital construction. The position involves communication with the City of Colorado Springs, Board of Regents, CCHE, Office of the State Architect.
Vice President (Part-time: June 2007 to Aug 2007)
Schendt Engineering, Inc.
Responsibilities: Design of building mechanical and plumbing systems.
Director of Facilities Services (Fulltime: 1997 to June 2007 then ½ time to Dec 2007)
The Colorado College
Responsibilities: Oversight of the operations, maintenance, capital construction, and utility systems for the college. Duties also include transportation services, EH&S and Campus Security (2006). Direct duties include staff leadership, oversight of the department's budget and capital construction. The position involves communication with the City of Colorado Springs and Board of Trustees on capital project issues.
Director of Facilities Management (Fulltime: 1989 to 1997)
Iowa State University
Responsibilities: Oversight of Facilities Management Division including facilities services (custodial, maintenance, grounds, mail, computer support services, and training) and two auxiliary services (flight service and golf course), and project management (requests for work, customer service, budgets, capital renewal, and energy conservation). The position also included cooperative relations with the City of Ames and reporting requirements to the State Board of Regents.
Associate Director of Facilities Planning and Management (Fulltime: 1987 to 1989)
Iowa State University
Responsibilities: Oversight of Operations (custodial, maintenance, grounds, mail), facilities utilization (classroom assignment), capital project budget oversight (budgets, Regents' procedures, construction and contract documents, bidding procedures, consultant and contractor payments, engineering), and project

management (requests for work, customer service, budgets, capital renewal, energy conservation).

Associate Director of Project Planning and Management (Fulltime: 1985 to 1987)

Iowa State University

Responsibilities: Facilities engineering and project engineering oversight (in-house design staff, engineering specifications, energy conservation), project management (requests for work, customer service, project budgets), and construction and contract administration (construction and contract documents, bidding procedures, construction management, consultant and contractor payments)

Assistant Director of Project Planning and Management (Fulltime: 1984 to 1985)

Iowa State University

Responsibilities: Assisted in responsibilities for facilities engineering and project oversight, maintenance planning, energy conservation.

Head of Facilities Engineering (Fulltime: 1982 to 1984)

Iowa State University

Responsibilities: Oversight of operations and maintenance engineering and energy management.

Head of Energy Management (Fulltime: 1981 to 1982)

Iowa State University

Mechanical Engineer (Fulltime: 1974 to 1977)

John Deere Dubuque Works

Mechanical Engineer (Fulltime: 1972 to 1974)

Flexsteel Industries, Inc.

5. Registration:

Professional Engineer, Mechanical, Iowa 8205, 1976 (inactive)

Professional Engineer, Mechanical, Colorado 32666, 1998

Class A Energy Auditor, Iowa 102, 1978

Certified Franklin Covey 7 Habits Facilitator, December 1999

6. Professional Associations:

National Society of Professional Engineers (1976 to present)

Colorado Engineering Society (1997 to present)

American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE)

APPA: Association of Higher Education Facilities Officers (APPA) (1981 to present)

7. Honors & Awards:

President Award, APPA, 2010

APPA Fellow, 2006

Meritorious Service Award, APPA, 1996

President Award, APPA, 1994.

Faculty Service Award, APPA Institute for Facilities Management, 1992.

Certificate of Appreciation, ASHRAE, 1992

Certificate of Appreciation, ASHRAE-Iowa Chapter, 1988

ASHVE-Homer Adams Award, 1979

1. Name
Timothy M. Scully
2. Education – degree, discipline, institution, year
Doctorate, Computer Science, Colorado Tech Univ, 1998
M.S. Electrical Engineering, Univ of Dayton, 1990
B.S. Electrical Engineering, Univ of Colorado (Denver), 1985
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
 - University of Colorado at Colorado Springs, Adjunct Professor, 2005 - Present, Part Time, Mechanical and Aerospace Engineering Department
 - University of Colorado at Colorado Springs, Adjunct Professor, 1997 - 2000, Part Time, Computer Science Department
 - USAF Academy, Instructor, 1993 - 1995, Full Time, Aeronautical Engineering Department
 - USAF Academy, Assistant Professor, 1998 - 2006, Full Time, Aeronautical Engineering Department
 - USAF Test Pilot School, Adjunct Professor, 2001 – Present, Modeling and Simulation
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
 - US Air Force – various technical and engineering positions, 1976 - 2001
 - US Air Force, Director, Aeronautics Laboratory, USAF Academy, 2001 – 2006
 - Booz Allen Hamilton, Lead Associate, Team Leader – Test and Evaluation Team, 2007 - Present
5. Certifications or professional registrations
Certified Ethical Hacker
6. Current membership in professional organizations
AIAA, INCOSE, ITEA
7. Honors and awards
UCCS College of Engineering and Applied Science Outstanding Teacher of the Year (Adjunct), 2008
8. Service activities (within and outside of the institution)
Member of the Board of Directors – Junior Achievement of Southern Colorado
Member of ITEA Education Committee
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

“An Investigation into a Neural Network’s performance based on the Number of Neurons in the Hidden Layer”, Timothy Scully, Kelly Cohen, 24th AIAA Applied Aerodynamics Conference San Francisco, 5-8 June 2006, AIAA 2006-3330

10. Briefly list the most recent professional development activities

- Developed “Test and Evaluation Bootcamp” – a 3 day course – received “equivalence” from the Defense Acquisition University for Test 102 credit

1. Name
James R. Torley
2. Education – degree, discipline, institution, year
M.E.; Aerospace Engineering; Univ. of Colorado, Colorado Springs, CO, 1998
M.S.; Physics; University of Maine (incomplete), 1966
B.A.; Physics; Beloit College, Beloit, WI, 1965
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
Taught advanced engineering courses at the graduate and undergraduate level for a total of 20 years.
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
Metatech Corporation; Albuquerque, New Mexico, 2002 to present
 - Assigned, in part, as technical liaison between Air Force Research Laboratory Satellite Assessment Center (SatAC) and Air Force Space Command, in Colorado Springs.
 - Present tasking includes providing satellite technical information and analyses to the Air Force Space Command (AFSPC) 25th Space Range Squadron and information requirements to SatAC for data mining and analysis.
 - Provide on-site support for implementation, testing and validation of SatAC developed software tools to Air Force Space Command.
 - Provide support to several Air Force Space Command space technology development and acquisition programs in the form of technical assessments/analyses.
 - Assist Air Force Space Command 25th Space Range Squadron Intelligence Flight in establishing technical parameters for data acquisition requests. Interface with U.S. STRATCOM Combined Intelligence Center and other national agencies for transmitting SIDC intelligence data requirements and retrieval of pertinent finished intelligence data.**MITRE Corporation; Colorado Springs, Colorado, 1980 to 2002**
 - Participated in requirements definition, source selection analysis and subsequent system testing of NORAD/U.S. Space Command Intelligence Data Handling System repository for space object information database. Provided input criteria for database structure to incorporate essential elements of information (EEI) for satellite systems of interest to U.S. Space Command. Assisted in intelligence information collection requirements definition to populate the IDHS database.

- Ten years experience as technical staff group leader in support of U.S. Space Command Intelligence Systems branch and Air Force Space Command Advanced Space Surveillance branch enables a broad perspective of user mission requirements, available information resources, simulation and modeling tools, verification and validation requirements, as well as task management and reporting duties pertinent to Air Force acquisition regulations.

- Twelve years experience as member of the technical staff supporting U.S. Space Command Intelligence Systems branch and Air Force Space Command requirements definition tasks, source selection activities and technical program monitoring.

5. Certifications or professional registrations
none

6. Current membership in professional organizations
none

7. Honors and awards
none

8. Service activities (within and outside of the institution)
none

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
NavGold – An On-Orbit Test Bed for Experiments in Formation Flight”; presented at AIAA Small Satellite Conference, Utah State University, August 1999.

10. Briefly list the most recent professional development activities
none

1. Name
Kyle Webb
2. Education – degree, discipline, institution, year
BA, Dartmouth College, 1997; BE, Thayer School of Engineering at Dartmouth College, 1998; MSEE, Oregon State University, 2005
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
University of Colorado at Colorado Springs, Adjunct Lecturer, part time, 2009 – present.
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
Hewlett Packard, Agilent Technologies, 1998-2009, R&D Engineer – Electronic hardware engineer designing oscilloscopes and logic analyzers.
5. Certifications or professional registrations
6. Current membership in professional organizations
7. Honors and awards
8. Service activities (within and outside of the institution)
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
10. Briefly list the most recent professional development activities

Appendix C – Equipment

Please list the major pieces of equipment used by the program in support of instruction.

Course #	Title of Course	Equipment (Model)
MAE 2200	Materials Engineering	<ul style="list-style-type: none"> a. Tensile Tester (Instron) b. Metallurgical Microscope c. Rockwell Hardness Tester d. High Temperature Furnaces e. Grinding/Polishing machines
MAE 3005	Engineering Measurement	<ol style="list-style-type: none"> 1. Oscilloscope (Agilent technologies DS01012A) 2. Multi-meters (Agilent technologies 34401A) 3. Waveform Generators (Agilent technologies 33220A) 4. Power supply (Agilent technologies E3620A) 5. Digital balance (Acculab Vicon) 6. Pressure Transducers (Omega PX181) 7. Thermocouple meters (Omega DP 132) 8. Strain Gage Indicators (Vishay P3) 9. Data Acquisition Cards (National Instruments N1USB6210) 10. Modulus of Elasticity setup (Vishay)
MAE 3131	Fluid Mechanics Lab	<ul style="list-style-type: none"> f. Hydraulic Bench (Armfield F1-10) g. Bernoulli Accessory (Armfield F1-15) h. Energy losses in pipes test set-up (Armfield F1-18) i. Digital Manometer (EXTECH Instruments 407910)

		j. Centrifugal fan (FM40)
MAE 3311	Heat Transfer Lab	<ol style="list-style-type: none"> 1. Linear heat conduction accessory (Armfield HT11) 2. Linear heat conduction accessory (Armfield HT15) 3. Unsteady state heat transfer accessory (Armfield HT17) 4. Heat transfer service unit (Armfield HT10XC)

Appendix D – Institutional Summary

Programs are requested to provide the following information.

1. The Institution

- a. *Name and address of the institution*
The University of Colorado Colorado Springs
- b. *Name and title of the chief executive officer of the institution*
Dr. Pamela Shockley-Zalabak, Chancellor
- c. *Name and title of the person submitting the self-study report.*
Dr. James Stevens, Department Chair
- d. *Name the organizations by which the institution is now accredited and the dates of the initial and most recent accreditation evaluations.*
North Central Association of Colleges and Schools (NCA), initial accreditation: 1970, most recent: 2006-2007.

2. Type of Control

Description of the type of managerial control of the institution:
state institution

3. Educational Unit

The Mechanical Engineering Program is located in the Department of Mechanical and Aerospace Engineering. The chain of responsibility is as follows:

Faculty of the Mechanical and Aerospace Engineering Dept.—James Stevens, Department Chair

Dean of the College of Engineering and Applied Science—Ramaswami Dandapani, Dean

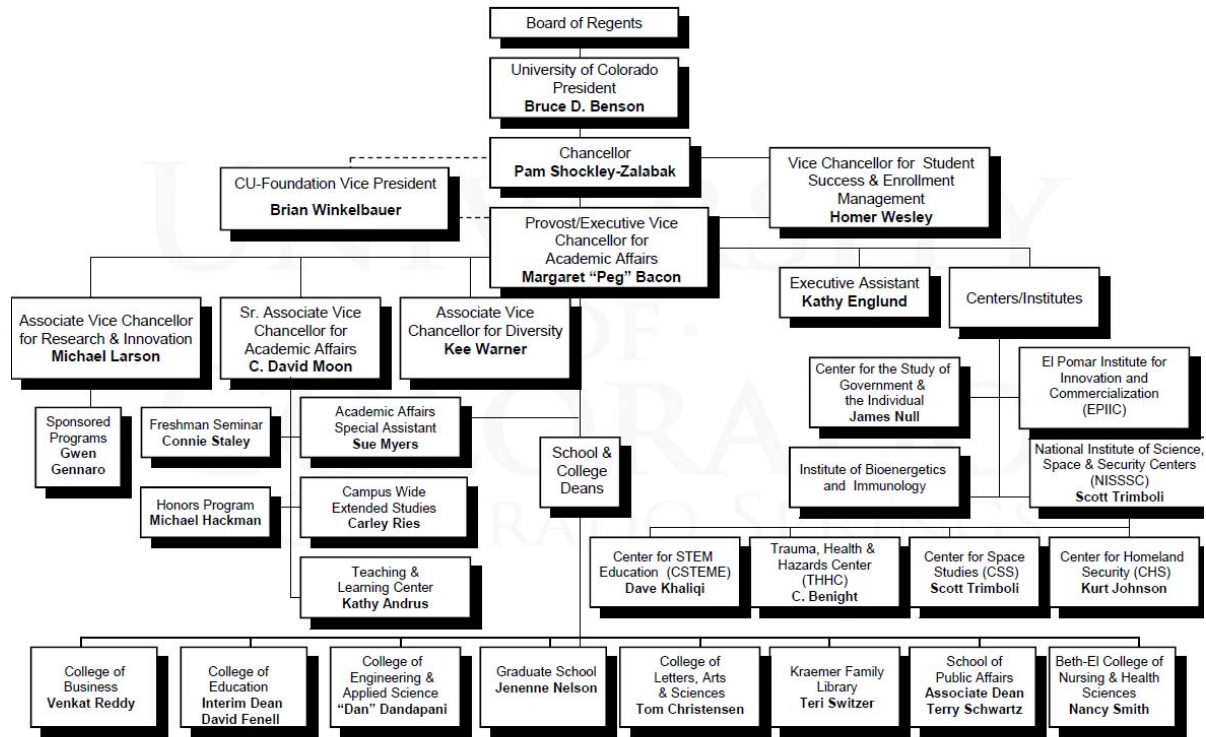
Provost/Executive Vice Chancellor for Academic Affairs -- Margaret “Peg” Bacon

Chancellor – Pamela Shockley-Zalabak

Campus Administrative Organization chart:

UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Academic Affairs



4. Academic Support Units

- English: Dr. Rebecca Laroche, Associate Professor, Chair
- Mathematics: Dr. Gregory Morrow, Professor, Chair
- Physics: Dr. James Burkhart, Professor, Chair
- Computer Science: Dr. Xiaobo Zhou, Professor, Chair
- Humanities: Dr. Teresa Meadows, Associate Professor, Director
- Biology: Dr. Jacqueline Berning, Associate Professor, Chair

5. Non-academic Support Units

- Library: M. Rita Hug, Head of Technical Services, Kramer Library.
- Campus Computing Facilities: Jerry Wilson, CTO and Executive Director of IT
- Internships: Jane Wampler, Internship Co-ordinator, EAS.
- Scholarships: Tina More, EAS Scholarship Coordinator
- Student Success Center: Robert King, Engineering Academic Advisor
- Disability Services and Testing Center: Ida Dilwood, Director

6. Credit Unit

UCCS and the MAE department use the standard units for semester credit hours meaning that a credit hour represents one class hour or three laboratory hours per week.

7. Tables

Table D-1. Program Enrollment and Degree Data

Mechanical Engineering

Current Year	Academic Year		Enrollment Year					Total Undergrad	Total Grad	Degrees Awarded			
			1st	2nd	3rd	4th	5th			Associates	Bachelors	Masters	Doctorates
				FT	57	38	51			52	24	222	24
	PT	5	6	4	5	10	30	10					
1	2009	FT	48	37	46	53	20	204	14		49	8	2
		PT	1	5	10	7	13	36	12				
2	2008	FT	54	49	49	43	25	220	13		47	3	0
		PT	3	4	13	8	12	40	9				
3	2007	FT	50	48	48	47	18	211	8		32	10	0
		PT	1	10	7	4	9	31	9				
4	2006	FT	41	48	37	36	12	174	12		21	5	0
		PT	0	6	5	4	5	20	12				

FT--full time
PT--part time

Table D-2. Personnel

Mechanical Engineering

Year¹: 2010

	HEAD COUNT		FTE ²
	FT	PT	
Administrative ³	1	-	0.50*
Faculty (tenure-track)	7	1	6.75*
Other Faculty (excluding student Assistants)**	2	10	3.07
Student Teaching Assistants	-	-	-
Student Research Assistants	-	-	-
Technicians/Specialists	1	-	1.00
Office/Clerical Employees	1	-	1.00
Others ⁴			

Report data for the program being evaluated.

- ¹ Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.
- ² For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc. For faculty members, 1 FTE equals what your institution defines as a full-time load.
- ³ Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.
- ⁴ Specify any other category considered appropriate, or leave blank.

*Department chair – 0.50 appointment considered to be FT by campus.

**Includes Instructors and Lecturers.

Appendix E. Mechanical and Aerospace Engineering Advisory Board

MAE Advisory Board		
Name	company	position
Dr. Bruce Johnson	Colorado Power	engineer
Dr. Ed Osborne	retired from Goodrich Corporation	retired owner of aircraft seating company, retired tenured professor at US Air Force Academy
Mr. Dan Parsons	Goodrich Corporation	engineering supervisor
Mr. Kevin Taylor	independent consultant	consultant
Dr. Garret N. Vanderplaats	Vanderplaats Research & Development, Inc.	Chief Executive Officer
Dr. Cary A. Fisher	United States Air Force Academy	professor emeritus
Ms. Evie Vance	Sturman Industries	engineer

Appendix -F1. Graduating Senior Exit Survey
SURVEY – BSME PROGRAM GRADUATES

Dear Senior:

In order to aid the continued success and improvement of our program, we would like your opinions and recommendations based on your experiences while obtaining your engineering degree. By completing this questionnaire, you can help shape this program and assist us in our goal of providing a quality education.

OUTCOMES: Rate the following in terms of your proficiency or preparation in that area:

Area	Poor	Fair	Average	Good	Excellent
an ability to apply knowledge of mathematics, science, and engineering					
an ability to design and conduct experiments, as well as to analyze and interpret data					
an ability to design a system, component, or process to meet desired needs within realistic constraints					
an ability to function on multi-disciplinary teams					
an ability to identify, formulate, and solve engineering problems					
an understanding of professional and ethical responsibility					
an ability to communicate effectively					
the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context					
a recognition of the need for, and an ability to engage in life-long learning					
a knowledge of contemporary issues					
an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice					
an ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes					
preparation to work professionally in both thermal and mechanical systems areas					

OBJECTIVES:

For each of the items listed below please rate how well you feel prepared at this point in your career.

Preparation Rating Scale:

1 - not at all, 2 – unsatisfactory, 3 – marginal, 4 – satisfactory, 5 - excellent

1. a. I am prepared to use mechanical engineering principles, proficiencies, and technical information to pursue graduate school 1 2 3 4 5

OR

- b. I am prepared to use mechanical engineering principles, proficiencies, and technical information to pursue a mechanical engineering career. 1 2 3 4 5

Comments:

2. a. I am equipped to pursue continued lifelong growth and development in mechanical engineering. 1 2 3 4 5

- b. I am prepared to continue learning and applying new engineering processes, tools, and technologies 1 2 3 4 5

Comments:

3. a. I am prepared to, in the future, contribute to the state-of-the-art in engineering design, research and problem solving 1 2 3 4 5

- b. I am prepared to, in the future, assume professional responsibilities in a mechanical engineering career 1 2 3 4 5

Comments:

As you finish the program:

How many student organizations/clubs did you participate during your college career? _____

Do you anticipate joining a professional organization and/or pursuing any kind of further education in your professional career? Yes / No

How many oral presentations would you estimate that you made as an undergraduate (of any length, to any group larger than 5)? _____

How many written reports would you estimate that you prepared as an undergraduate (longer than 1 page)? _____

How many students, besides mechanical engineering majors, would you estimate that you have *worked* with, in any capacity, during your time at UCCS? _____

In your opinion, what is the most significant engineering problem facing the world today?

Name the two or three faculty members that have had the greatest positive influence on your educational experience at UCCS, and why.

If there was a faculty member/s that affected you in a negative way, please discuss them also.

What did you especially like about the program?

What did you especially dislike about the program?

Appendix F-2 Spring 2007 Exit Interview Results

Major Items--mentioned multiple times

- 1) Students were very appreciative of small classes and instructor accessibility. Most of the students mentioned this.
- 2) The second most prevalent comment was with regard to hands-on activities. Summarizing somewhat, the general sentiment seemed to be that we could improve the curriculum by adding more hands-on, laboratory, or application activities. Several students were complimentary of the scope of their education with respect to depth, material, and topics, but wished for more opportunities to see and do as opposed to learning out of textbooks and classrooms.

I note that most of these students came through our curriculum before the classes MAE 1502-1503, were added and before our lab classes were at the level they are at now. Nevertheless, this is something that we should discuss further.

- 3) Several students mentioned having Maurice Jackson as an instructor as a particularly unpleasant experience. This issue is resolved as we will not be hiring him again.

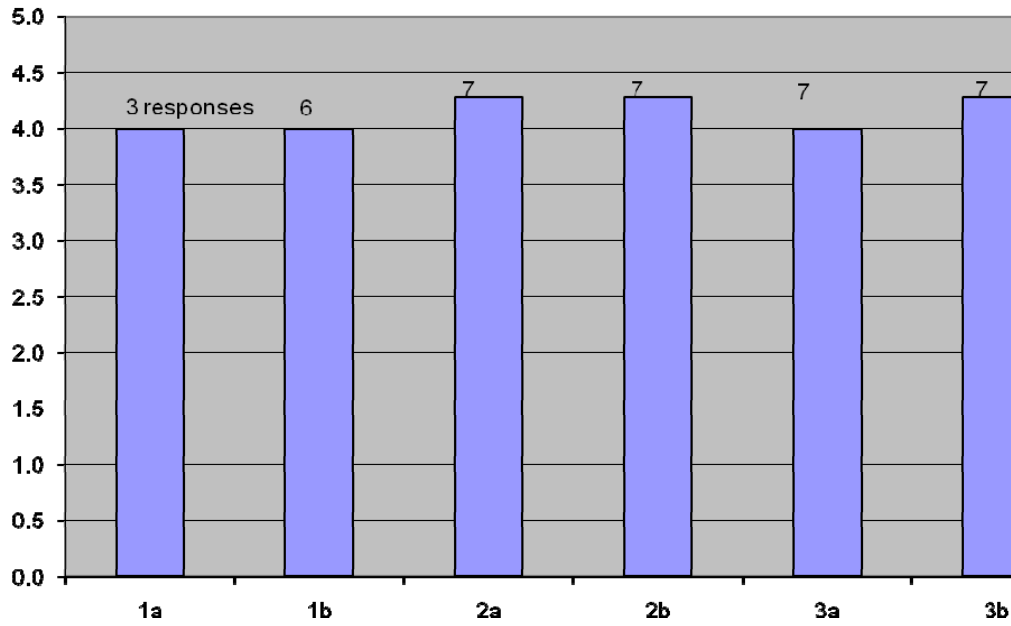
Minor Items--mentioned a couple of times

- 1) A couple students wished for more instruction and practice using MATLAB before getting to upper division classes.
- 2) Help with external things like finding an internship or preparing for the FE exam was mentioned. There is some dissatisfaction with the level of help that the student support office provides for locating internships. The student discussing the FE exam only wished for more information-- what it is about, when it is given, etc. We could provide that kind of support quite easily.

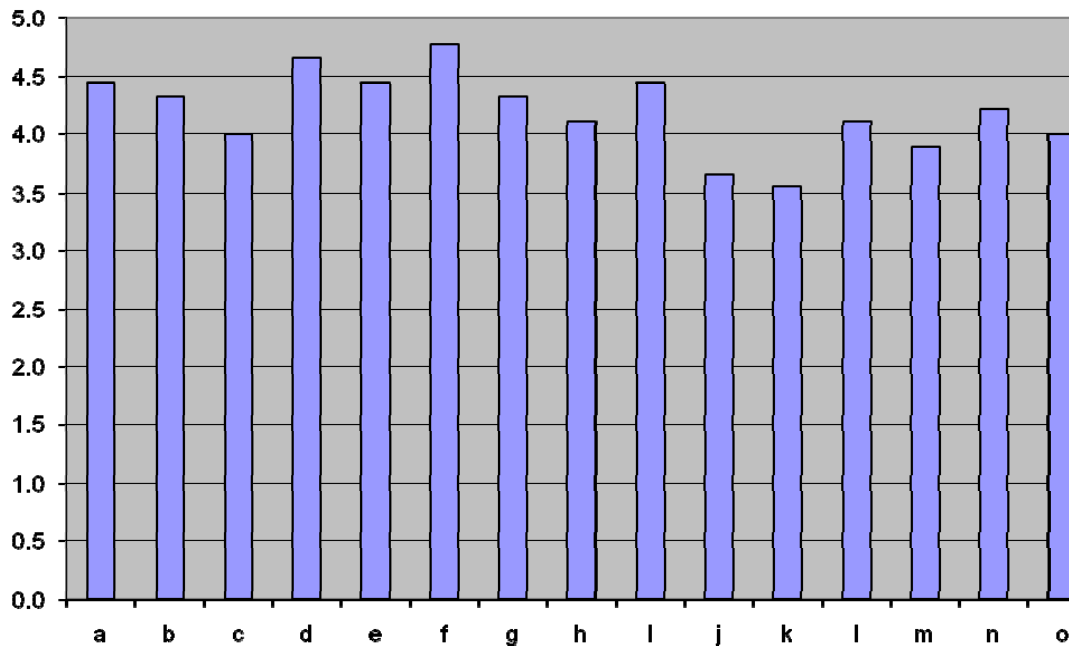
Surveys

The surveys were very positive for both program educational objectives and program outcomes. In the curriculum survey, engineering graphics, computer science, electrical circuits, and materials were the lowest rated and the only categories with average score less than 3.5. There is some lag with surveying graduating seniors: the engineering graphics and electrical circuits issues have already been addressed with changes in the curriculum. The area of materials does need to be addressed. Our position regarding the computer programming course has been that we want students to learn the concepts of programming from that course. I think that our position is sound, and that the course achieves that objective. I think that the problem is one of perception: the students don't use that particular programming language much, if ever, so they perceive the course as less useful.

program educational objectives



program outcomes (9 responses)



Exit Survey Results for Spring 2007—top figure is for program educational objectives and bottom figure is for program outcomes.

Faculty Meeting: Tuesday, September 11, 2007

Present: Julie Albertson, Peter Gorder, Ken Lauderbaugh, Michael Larson, Dave Schmidt, Jim Stevens, and Steve Tragesser

Absent: Rebecca Webb

.
. .
.

Exit Interview and Assessment Process:

- We interviewed 10 students last spring and have identified some of the things they mentioned:
 - Wished for more hands-on activity
 - Preference for small classes and instructor accessibility
 - Noted an instructor they did not like
 - Fundamental Exam – need assistance with prep review
 - MatLab – need instruction and practice
 - Lack of prospective internship. Rosemary Kalkelb is the new half-time employee who now handles internship. Jim will ask Dan for information on a recruitment tool whereby organizations directly post internship opportunities and students post their resumes.

Appendix F-3

Fall 2007 -- Exit Interview Results Summary

- 1) I had exit interviews with 16 graduating seniors, and received completed written surveys from 15 of the 16.
- 2) On the average, students participated in 1 club or extracurricular group during their time in our program. For those who did not participate in any, I asked why, and without exception it was because they were working part- or full-time and felt like they didn't have time for anything beyond the bare minimum. Some expressed a wish that they could have participated in more. Several of the students who were active in various organizations wished that there were more students participating.
- 3) Fourteen out of fifteen survey respondents indicated that they expected to join a professional organization and/or pursue further education in their career. This speaks positively both to our program outcome (i) about lifelong learning, and our second educational objective regarding continued growth and development.
- 4) On average, students estimated that they had completed 23.9 oral presentations and 22.9 written presentations through the course of their undergraduate program. I was surprised at the magnitude of these numbers. The students are apparently getting practice with written and oral presentations -- are we doing enough to give appropriate feedback and help them improve?
- 5) The average response to the question about how many students that they had worked with through their undergraduate program was 52.9. In talking about this with the students, there was a lot of variation. Some felt like they had worked a lot with students from across the university, others felt like they had only worked with engineering students, and a few felt like they had only worked with MAE students in our classes. Some of that variation had to do with participation in clubs and other extracurricular activities, but not all of it. It may be partly a perceptual thing, but I was not able to narrow it down better. Perhaps the question should be modified, somehow, to better get at what kind of work, and with whom.
- 6) The quantitative results on outcomes and objectives were similar to the results from exit interviews from last spring. For the objectives the fall surveys were slightly higher on all questions. For the outcomes, some were slightly higher and some were slightly lower. In all cases the average response was close to (4) corresponding to "satisfactory" on the objectives (between "marginal" and "excellent") and corresponding to "good" on the outcomes (between "average" and "excellent").
- 7) At the time of the interviews, (which was before the end of the fall semester) 9 students were looking for a job, and 7 already had jobs lined up. Of the 9 who were searching, about half expressed a strong preference to find something local. Of the 7 who had jobs, 5 were traditional

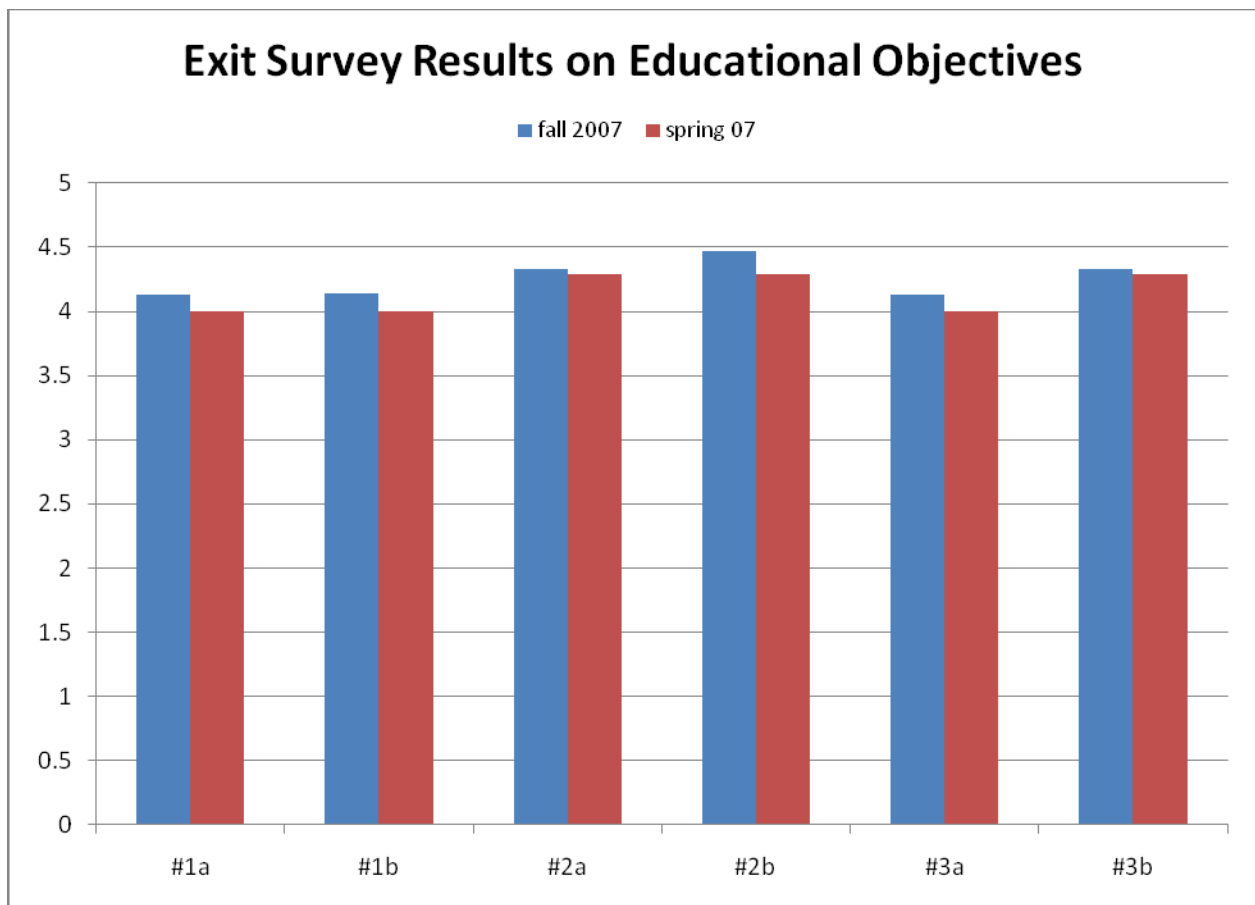
engineering jobs, one was with a financial services company, and one was to be a commissioned officer in the U.S. Army.

8) Positive items from the exit interviews:

- Many students commented on our small class sizes and excellent faculty.
- Many described faculty as helpful, available, and interested in teaching.
- Several liked having honoraria for teachers, (but several didn't, too).

9) Negative items from the exit interviews:

- Several students wanted better instruction in MATLAB.
- Several students wished for improvement in laboratory classes including better facilities, more hands-on laboratory activities, more extensive lab experience. (A couple commented that they had seen improvement here even in the time they were moving through the program).
- A couple of students commented negatively on the location of University Hall, but all understood that we would be moving to the new building. Several expressed regret that they wouldn't be here for the move.



Exit Survey Results on Outcomes



Summary of faculty discussion of Fall 2007 exit interview results

2/12/08 – first faculty meeting of spring 2008

item #9 in chair report

Faculty are doing MATLAB review in conjunction with their classes. We will be modifying our curriculum starting in fall 2008 so that our required programming class specifically addresses using MATLAB for engineering problem solving.

*discussion of MATLAB in classes, student applications, faculty approaches

*math help center has a tutor specializing in MATLAB, some students have reported helpful

item #4 in chair report

Julie is working on improvements in oral presentations. We may consider a uniform format for reports and presentations.

*discussion on potential formats, pros and cons of a single format, primer on grading, consistent rubric on grading written and oral reports or presentations

*San Luis Obispo has very strict grading policy, advantages, disadvantages, helpful in some ways.

outcomes j & k

j. a knowledge of contemporary issues

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

These two outcomes seem to be consistently low in exit interview poll.

*discussion of reasons: it might be expected that “j” would be low in engineering, contemporary issues tend to be discussed less formally, possibly covered, but students don’t recognize that – real or survey measurement issue?, natural to bring into class to enliven lectures, difficult to require, both faculty and honoraria should be able to relate to contemporary issues as applied to engineering

*discussion of k: similar to “j”: is it real or survey effect? student perceptions of what is needed/important may not be adequate, also addressed by using current examples and illustrations in class to show that what they are learning is relevant.

general discussion of status, process

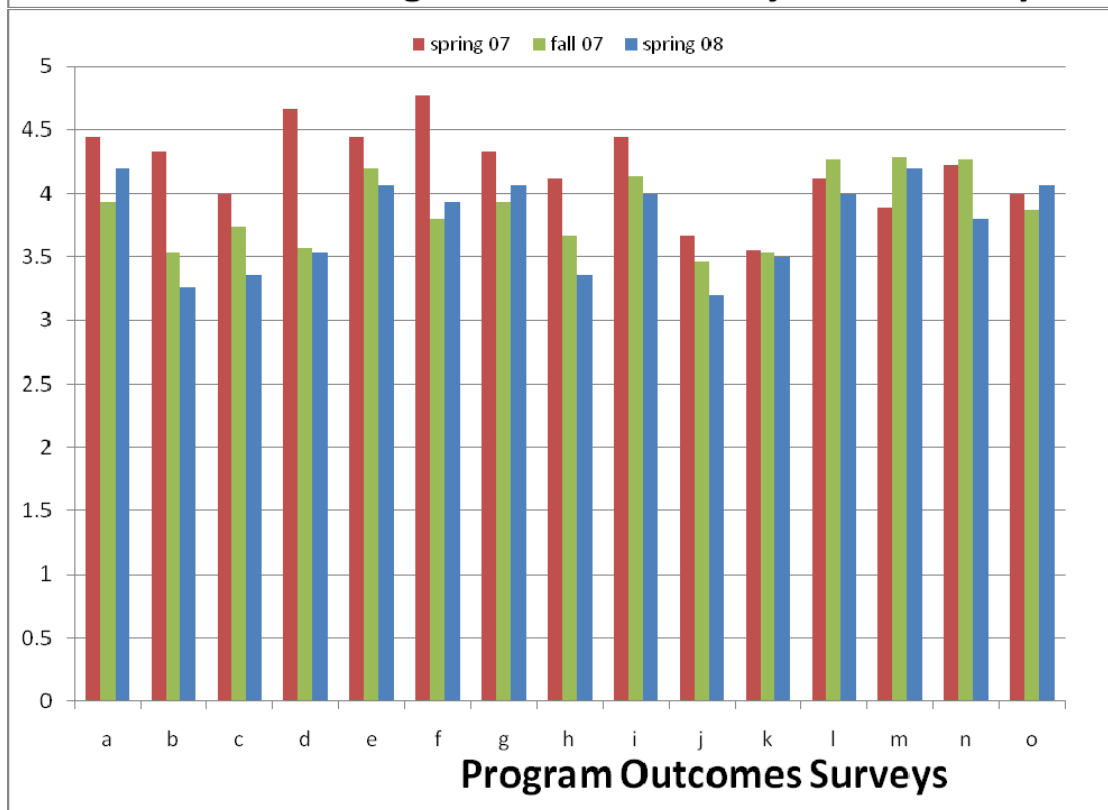
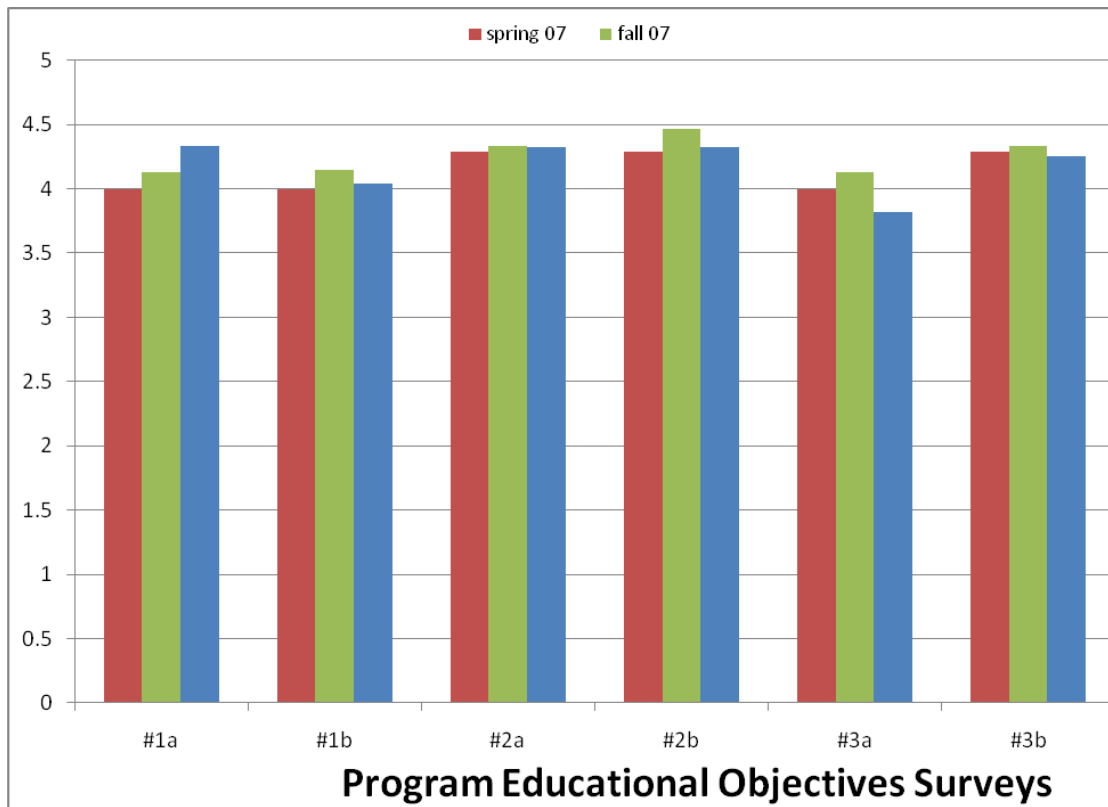
*most valuable part of process may be the review

- *consistent review over time important to keep track, discern trends, etc.
- *student input most useful, comments more than survey
- *survey gives comparable data, comments only qualitative
- *department is doing really well
- *importance of continuing consistent process

Appendix F-4

Spring 2008 Exit Interviews -- Summary of Results

- (1) I had exit interviews with 15 seniors graduating in Spring 2008.
- (2) Of the 15, all but three had definite plans after graduation. Those three are actively looking for employment. Others:
 - 2 engineering jobs at El Paso Corporation
 - 3 other engineering jobs: Lockheed, Textron, unspecified
 - 2 commissioned officers in the military (1 US Army, 1 US Air Force)
 - 1 plans for graduate school
 - 3 international travel (2 for religious endeavors, 1 for fun)
 - 1 professional golf circuit
- (3) As in past semesters, students commented often on our small classes and accessible professors. They appreciate the opportunity to get to know their professors and fellow students. Some mentioned that as a principle reason for choosing UCCS.
- (4) The students were largely positive about their experiences with our permanent faculty. The feedback was more mixed regarding the part-time instructors. They were very enthusiastic about several of the part-time instructors. The ones of whom they were most critical were all cases where we had realized that there was a problem and determined that we would not hire the individual again.
- (5) There was a lot of positive and negative comment about our laboratories. Many students felt like the laboratory classes are moving the right direction. Several commented that they had seen improvement during their time in the program. However, both conduct of lab classes and laboratory facilities remain as the most significant negative comment points.
- (6) Most students were aware that we are instituting a new programming class that will be taught in the MATLAB environment, and they were universally enthusiastic about that change. Many indicated that they wished that they'd had the opportunity to take it.
- (7) Nine of the fifteen indicated that they would definitely join a professional organization following graduation. All students reported completing significant numbers of written and oral reports. Eleven of the fifteen participated in one or more clubs. Several commented that work obligations limited the amount of time that they felt that they could devote to extra-curricular activities like clubs and other student organizations.
- (8) The survey data indicated that the weakest program outcome was "j. a knowledge of contemporary issues". In discussing this with the students, they felt that contemporary issues were important, but not always germane to the teaching of some subjects. So for at least some of the students, this item reflected a state-of-affairs, but not a need for change.



MAE Faculty meeting, 9 September 2008

Summary of Spring 2008 Exit Interview Results

1) comment:

lower scores on outcomes seem to correlate to real-world things e.g. design experiments, design systems, contemporary issues.

discussion:

a) connections to industry are important; senior design has strongest connections to industry; honoraria teaching classes are another connection; do they bring in appropriate experience? discussion about honoraria styles, discussion of appropriate

b) senior design and 1503 are the main locations of h & j (global and societal context, contemporary issues); other classes e.g. Thermo II and machine design emphasize design, and could contribute

c) we've put an enormous amount of effort and resources into the laboratory sequence already; is it not reflected in design of experiments? laboratory committee is examining lab course sequence for continuity and coordination-- will add design of experiments; heavy adjunct involvement is good and bad; consistency is important: sometimes it is excellent, sometimes poor; we need to improve consistency

2) comment:

question on contemporary issues is very vague, i.e. maybe we are doing what we want, but the students don't connect that with the question

discussion:

a) should we give some priming on what the questions mean?

b) review the survey, see if it should be worded differently

3) comment:

FE review sessions would support students, seems to be interest

discussion:

a) already offered, student response is lacking, waiting for demand to merit it

b) we'll provide materials on how to apply

c) we'll get FE prep materials for help center

4) comment:

Item #4 on the summary: do we need to screen instructors differently?

discussion:

a) partly it is the nature of the thing: we sometimes hire new instructors, and no matter how carefully we look at credentials and resumes, it finally depends on how they do in the classroom

- b) review materials that they are given, strengthen lead instructor system – working pretty well, but could be made stronger
- c) chair will sit in on selected classes
 - d) keep trying to get ahead on planning instructors—some issues with planning ahead, last minute changes
 - e) prepare an instructor orientation? wide range – many very experienced with us or at AFA, others relatively new
 - f) shouldn't go overboard: overall, excellent history of success with honoraria – bring in less academic viewpoint, expose students to variety, regularly have reports of “best” or “favorite” teacher from among honoraria, some misses, mistakes, but overall working very well

Appendix F-5

Fall 2008 Exit Interviews – Summary of Results

(a) interviews: I had interviews with 15 graduating seniors. The average GPA of this group was 2.75 with a high of 3.55 and a low of 2.03.

(b) plans: At the time of the interviews (mid Nov through early Dec.) 8 of the 15 had definite engineering jobs or job offers. These included: Northrop Grumman(3) in Colorado Springs, Toyota, Goodrich, Bechtel, Siemens, John Deere. Of the remaining seven, two had interviews scheduled (Boeing, Excel) and were optimistic about their prospects, four were actively looking for a job and one intended to relocate immediately after graduation and wouldn't begin looking until he moved.

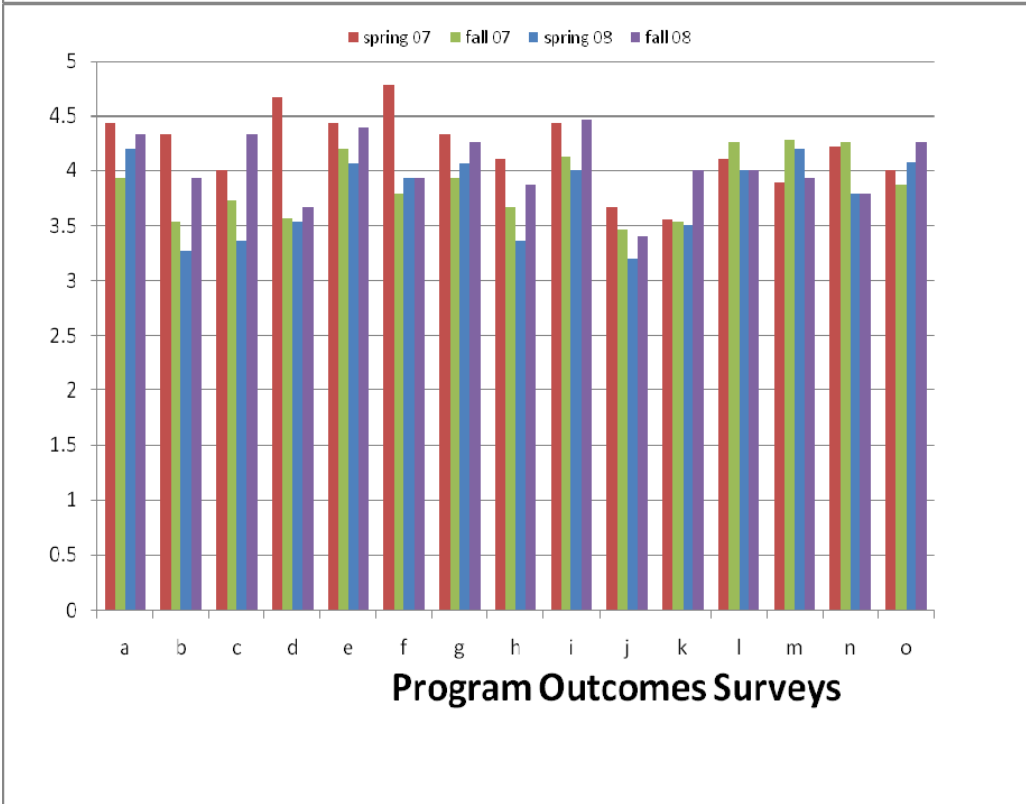
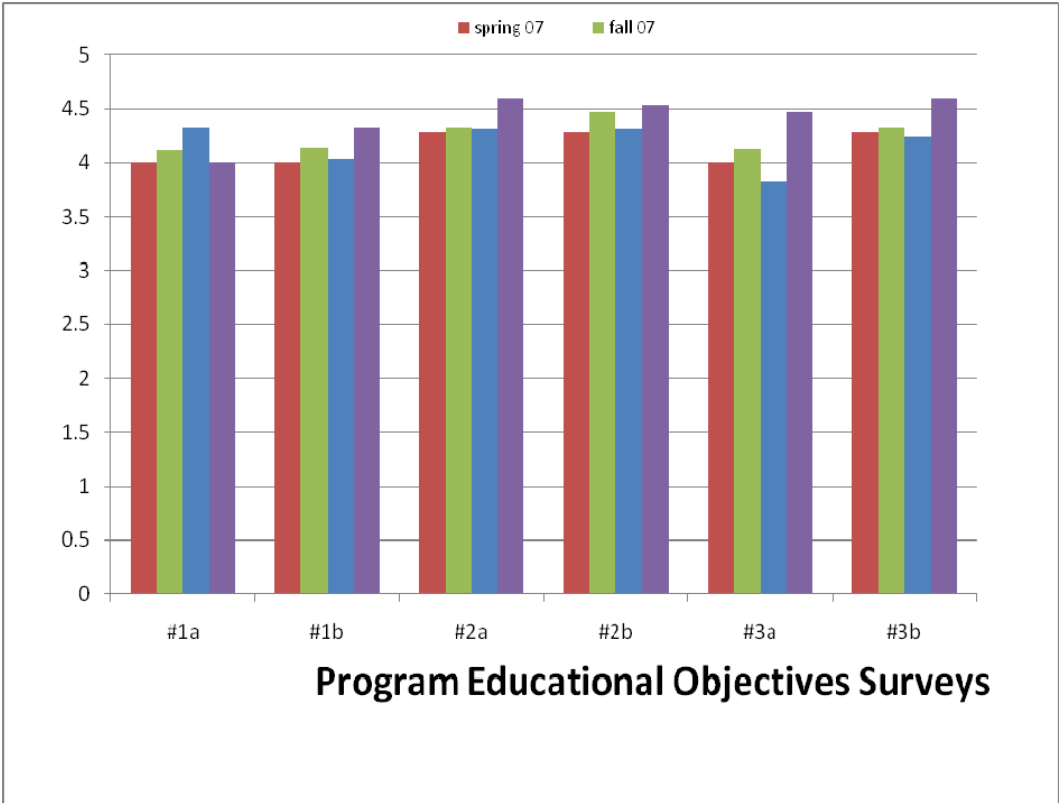
(c) positive feedback: Students were very positive about small classes including comments about being able to know the professors and have them know the students. Access to professors, quality of faculty, and technical rigor were also mentioned. One student who was going to a job at Northrop Grumman mentioned that someone there had indicated a preference for UCCS mechanical engineering graduates over CSU.

(d) negative feedback: There was no consistent theme in the negative comments this time. It is encouraging that negative comments about laboratory facilities and laboratory conduct were no more prominent than any other topic (just one comment). Other topics, all with only one or two negative comments, included: honoraria, falling faculty/student ratio, too few technical electives, emphasis on teamwork, too much homework, writing portfolio, EIT preparation.

(e) clubs, professional organizations, reports: Most students worked full or part-time while attending school. That was the overwhelming reason for not participating in clubs and extracurricular activities for those who didn't. Thirteen of the fifteen planned to join a professional organization following graduation. Students indicated that they had completed many oral and written reports.

(f) outcomes & objectives surveys: Results on the outcomes and objectives surveys both tended to be a little higher than in recent semesters. Item C dealing with ability to design took a fairly large jump upward, while item J dealing with knowledge of contemporary issues remained our lowest outcome.

(g) other comments: Many of the students chose UCCS because they lived locally, or had some local connection, but many transferred from other schools (Mines, CSU, Boulder, others) because they saw UCCS mechanical engineering as a viable, or in some cases preferable option. Most expressed satisfaction with the program and their degree and several indicated that they felt the program was moving in the right direction. Several wished that they would be here for the move into the new building.



MAE Faculty meeting, 10 February 2009

Summary of Fall 2008 Exit Interview Results

1) comment: EIT (FE) preparation could be done by a Pi Tau Sigma chapter
discussion:

- (a) common practice at other schools
- (b) how involved to set-up? discussion of setting up PTS
- (c) ASME might also do same function
- (d) check with ASME for interest

2) comment: few technical electives

discussion:

- (a) balance between aero minor and other topics
- (b) topics: finite elements, robotics vibrations, composites, adv. thermodynamics
- (c) focus on topics related to faculty expertise
- (d) student interest
- (e) permanent vs. full-time faculty teaching tech electives
- (f) budget constraints, class size
- (g) we will look into expanding to at least get some balance with aero minor

Appendix F-6

Spring 2009 Exit Interviews – Summary

(1) general: I had interviews with 27 students graduating spring semester with an average GPA of 3.32. The high was 3.96 and the low was 2.28. There were six students with overall GPA > 3.73.

(2) jobs: At the time of the interview, 6 of the 27 students had job offers in place, 12 were looking for a job, 8 were going to go to graduate school (4 at UCCS) and 1 was planning to move to Germany with a spouse in the military. Of the 12 who were looking, most were actively interviewing, and none seemed pessimistic about finding an engineering job. Companies which had extended job offers included Magnum Mfg., ITT, Missile Defense Agency, Northrop-Grumman, El Paso Corp., and US Air Force (civilian). Named graduate schools included Virginia Tech and UCCS.

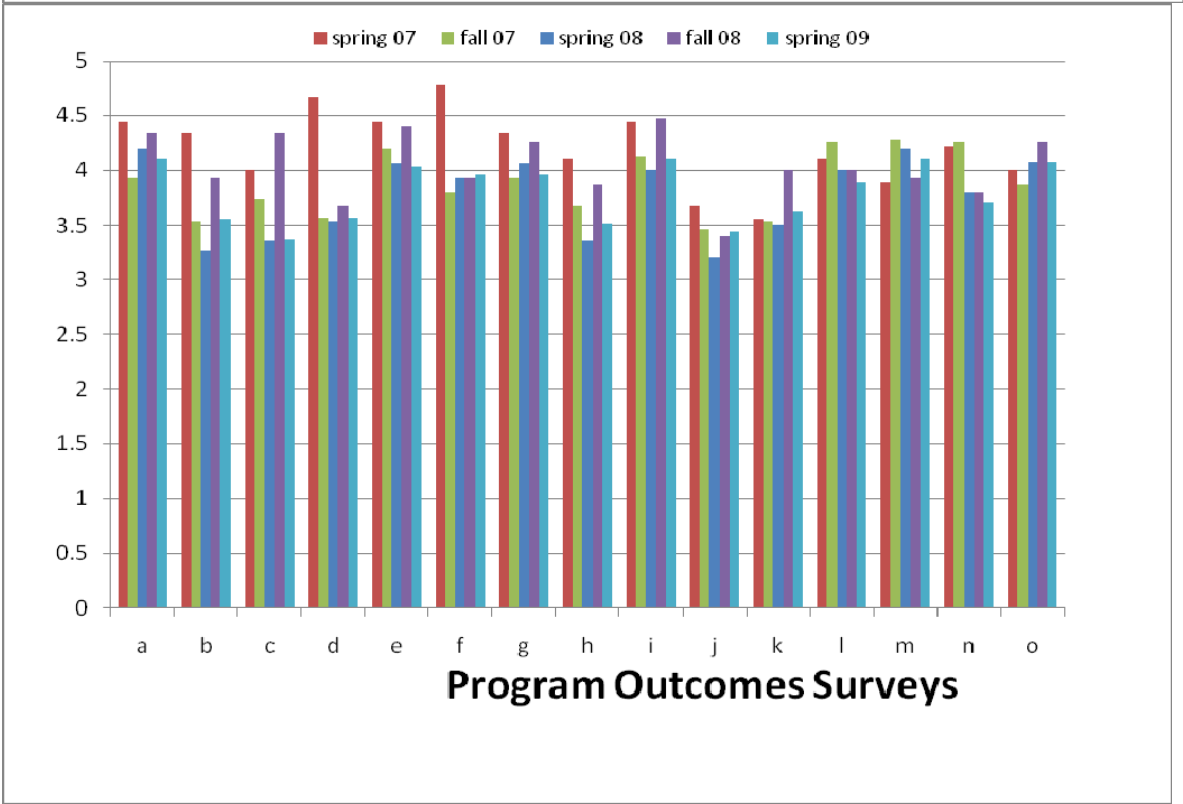
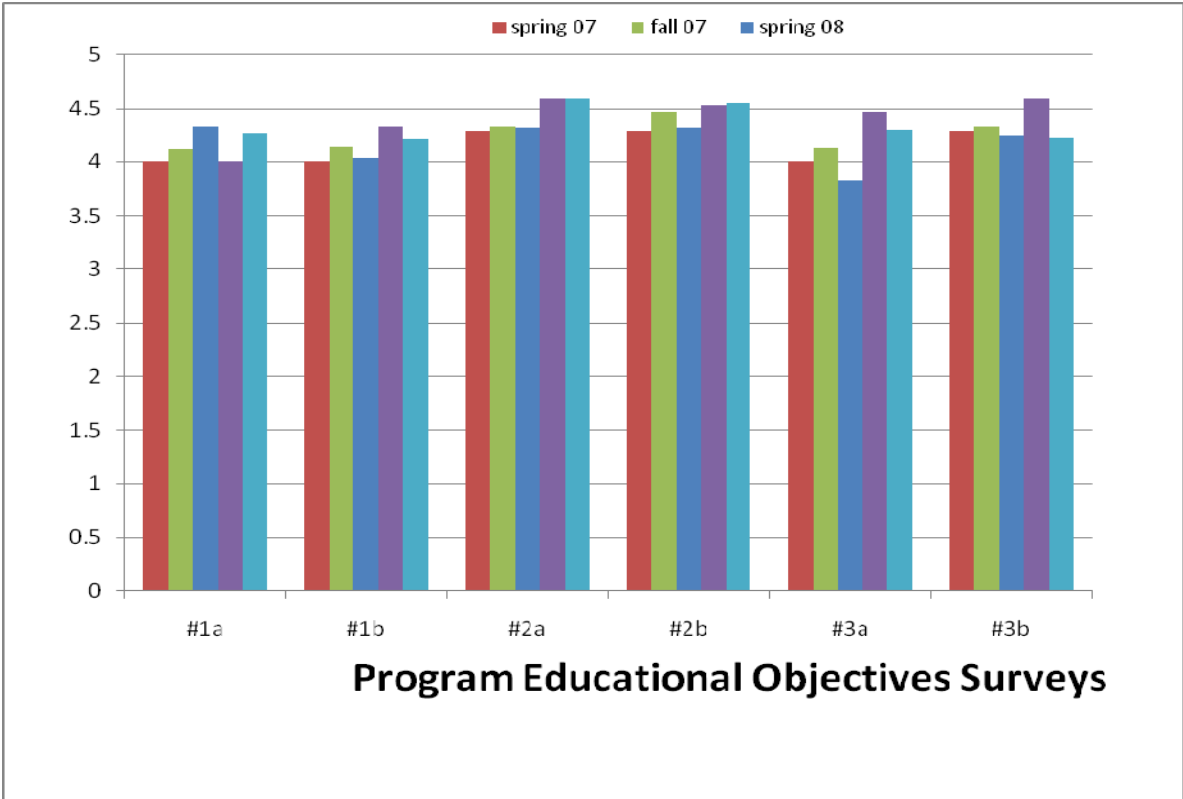
(3) positive comments: As usual, students were very positive about small classes and the opportunity to develop close relationships with the professors. They were highly complimentary of the full-time faculty in the department. Several praised their senior design project and senior design experience. Many came to UCCS because they lived locally and/or because UCCS had lower tuition cost than other state schools. However, most of those viewed the mechanical engineering program here as a competitive alternative to other state schools and made the decision with respect to cost/location on that basis.

(4) negative comments: Several students wished for a greater variety of technical electives outside of the Aerospace minor. Several students expressed dissatisfaction with lack of rigor in selected classes, although they felt that the program as a whole was satisfactory in this respect. Note that this class has a somewhat anomalous number of high performing students. Many students were unhappy that they were graduating without getting to move into the new building. Several were dissatisfied with their own MATLAB experience, but recognized that we have made a change to address that for later students. Several students expressed dissatisfaction with shortened (accelerated) summer classes.

(5) other: Almost all students (25/27) intended to become involved in a professional organization following graduation and most (17/27) were involved in one or more clubs during their undergraduate career. Most felt like continued education would be part of their engineering career.

(6) outcomes & objectives surveys: The results of the quantitative outcomes and objectives surveys were in line with previous semesters. At this point we have five semesters of data so that trends and/or unusually high or low returns should be quite visible. On Program Outcomes, outcome (c), “an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety,

manufacturability, and sustainability” and outcome (j), “a knowledge of contemporary issues” remain the ones most needing attention.



MAE Faculty Meeting
15 September 2009
Senior Exit Interview Review

The quantitative results of the surveys and the chair's summary of student interviews were distributed to the faculty and reviewed. The following is a summary of major points in the ensuing discussion:

question: How does the gpa of this group compare with previous graduating cohorts?

answer: I haven't tracked it for long, but this one was higher than previous.

comment: Outcome "c" (on design) remains low in spite of our efforts in teaching design.

comment: Senior Design class surveys show just the opposite: students there feel like they have an excellent handle on the design process.

comment: Informally, students in other classes that get design problems seem to have a hard time getting their heads around design problems: different approach from homework problems and sometimes they don't know where to start or how to proceed.

comment: But that is part of the education process— we start off with small design problems in freshman classes and they struggle with increasingly more difficult problems as they progress.

further discussion on design in our curriculum

comment: Design problems (entry level) are used in the freshman classes...

comment: The issue may lie in the phrasing of the question...

extensive discussion on the survey questions on the senior exit survey and on the Senior Design course questionnaire, discussion on desirable question phrasing, discussion on sample size

conclusion: Outcomes assessment would be improved by changing the phrasing on the assessment survey instrument to read something along the lines of "Evaluate your proficiency..." This change was made in the survey instrument that will be used in the future.

Appendix F-7

Fall 2009 Exit Interviews – Summary

I had interviews with 18 students. The average GPA was 3.14 with a high of 3.79 and low of 2.24.

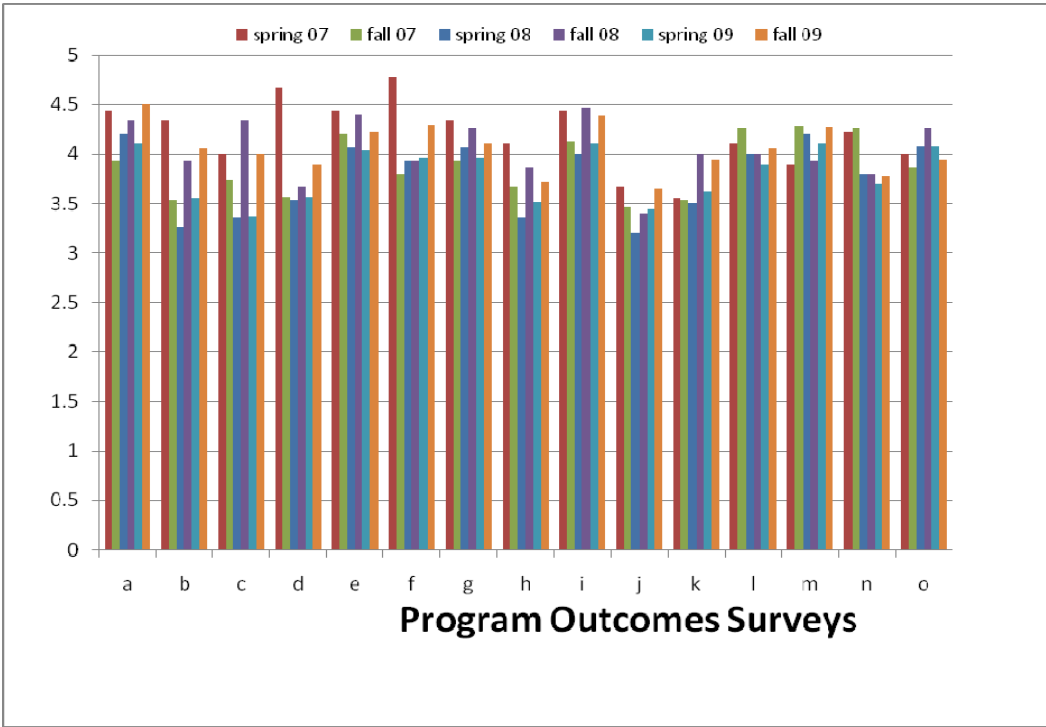
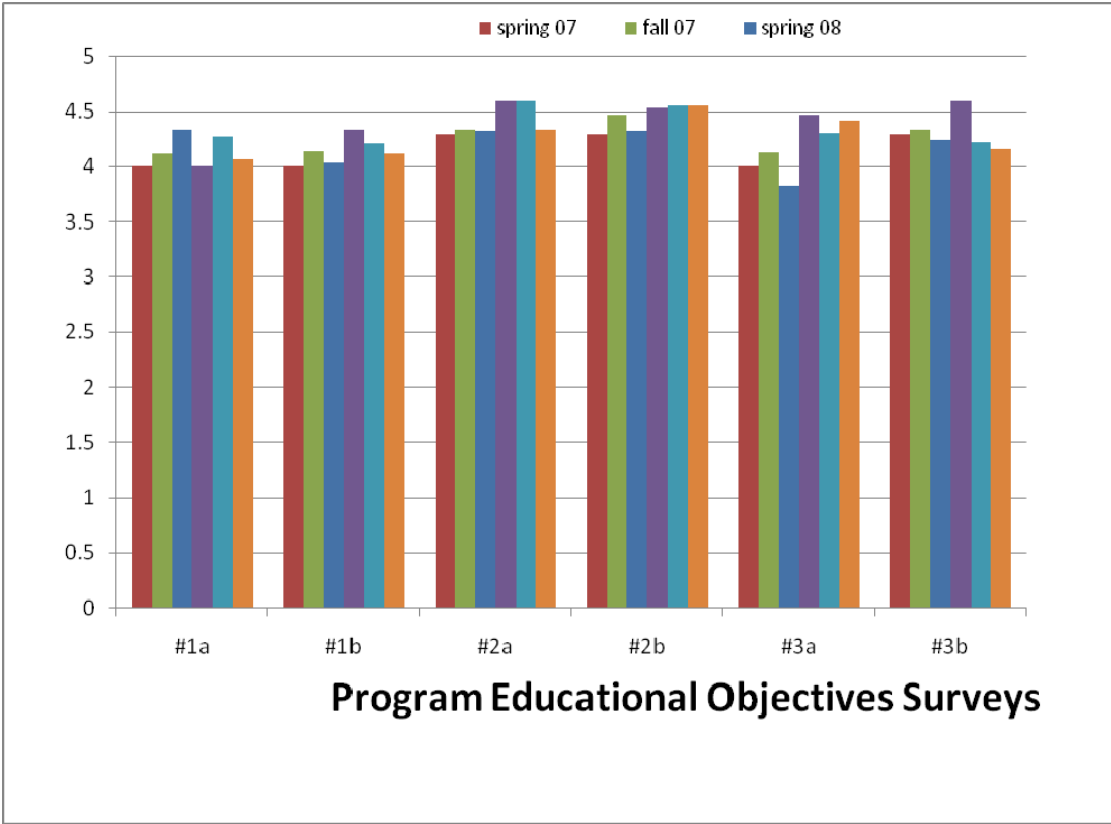
JOBS: At the time of the interview, (mostly in November) 7 of the 18 students had engineering jobs or firm engineering job offers. Two students were not looking for work as they planned to take the winter off to ski and begin job hunting in the spring. The remainder were all actively interviewing. About half of those had a job of some kind (not necessarily engineering) but were looking for an improvement that would be an engineering job, a permanent job, or a full-time job. Companies that the students went to included: ITT, Western Forge, civilian at Schriever, AF officer, Northrop-Grumman, Army Corp of Engineers, El Paso Corp.

POSITIVE COMMENTS: Students were enthusiastic about the faculty. Several made comments to the effect that they liked the fact that most of the professors seemed to really care about teaching and were available for help. Several students commented positively about the availability of help in the MAE help center and in the campus learning centers. They liked having small classes and especially liked senior design and most technical electives.

NEGATIVE COMMENTS: There was no single consistent theme in the negative comments this time. A couple of students thought that we do not do enough to police cheating on homework and exams. Some thought that we have too many projects in the curriculum, while others thought that we don't have enough. There were still a few comments on laboratory equipment (lacking), though not nearly as many as previously. There was almost no negative feedback about honoraria this time, which is unusual.

OTHER: As is typical, a high percentage (16/18) of students intend to join a professional organization after graduation. Most students chose UCCS because it was local; either they were from Colorado Springs, or they were living here for some other reason. We did have a couple of students who came from out-of-state specifically to come to school here.

OUTCOMES & OBJECTIVES SURVEYS: The results of the quantitative outcomes and objectives surveys are attached. Note that this semester (Fall 09) is the first semester using the slightly changed wording that we decided upon in the discussion of the Spring 09 Exit Interviews for Outcomes Assessment. Our new wording is "Rate ... your proficiency or preparation ..."



MAE Faculty Meeting

9 February 2010

Senior Exit Interview Review at the faculty meeting

Present: Stevens, Larson, Gorder, Webb, Tragesser, Pingen, Albertson, Sooklal, Nylund

The summary of the exit interview results were distributed to the faculty.

*discussion regarding cheating

–did students have any suggestions?

–discussion of faculty approaches

–discussion of cautionary notes regarding prosecuting cheating

*discussion of “knowledge of contemporary issues” and “broad education”

–what are we doing?

–should we do more? do less?

–not all classes, but definitely covered in more than one

*discussion of “linear algebra and statistics”

–no longer an ABET requirement for ME programs

–extensive discussion of student performance, various classes which use them

Appendix F-8

Spring 2010 Exit Interviews – Summary

I had exit interviews with 26 students. The average GPA was 3.21 with a high of 3.97 and low of 2.44. I've attached a graph showing the history of average GPA.

JOBS: At the time of the interviews in April, 11 of the 26 students had engineering jobs or firm engineering job offers. Two students were going to graduate school, one in engineering and one in philosophy. Three students were going to travel, work at a church, and open a non-engineering business. The remainder (10) were actively looking for engineering jobs. Some of the companies that the students went to included: General Motors, CEA Technologies, Aeroflex, AFA, Frito-Lay, Cobb Mechanical, and Magnatex pumps.

POSITIVE COMMENTS: On the whole, students were very positive about their experience with the faculty and with the program. As usual, senior design and technical electives were noted as positive experiences. Several students commented that they felt that the program was continuously improving. Several students noted that small class sizes were a positive aspect of the program.

NEGATIVE COMMENTS: The only common complaint was a desire for more technical electives outside of the aerospace minor.

I've assembled a partial list of positive and negative comments on subjects other than specific faculty on the following page.

OTHER: Most students (22/26) plan join a professional organization after graduation. Most students continue to come to UCCS because they were in Colorado Springs for some reason, but we had four students transfer from other 4-year universities, and three students choose UCCS from out-of-state and move to Colorado Springs to attend the school. Two students came to UCCS with the intention of transferring to another school after a couple of years but wound up staying to complete their degrees here.

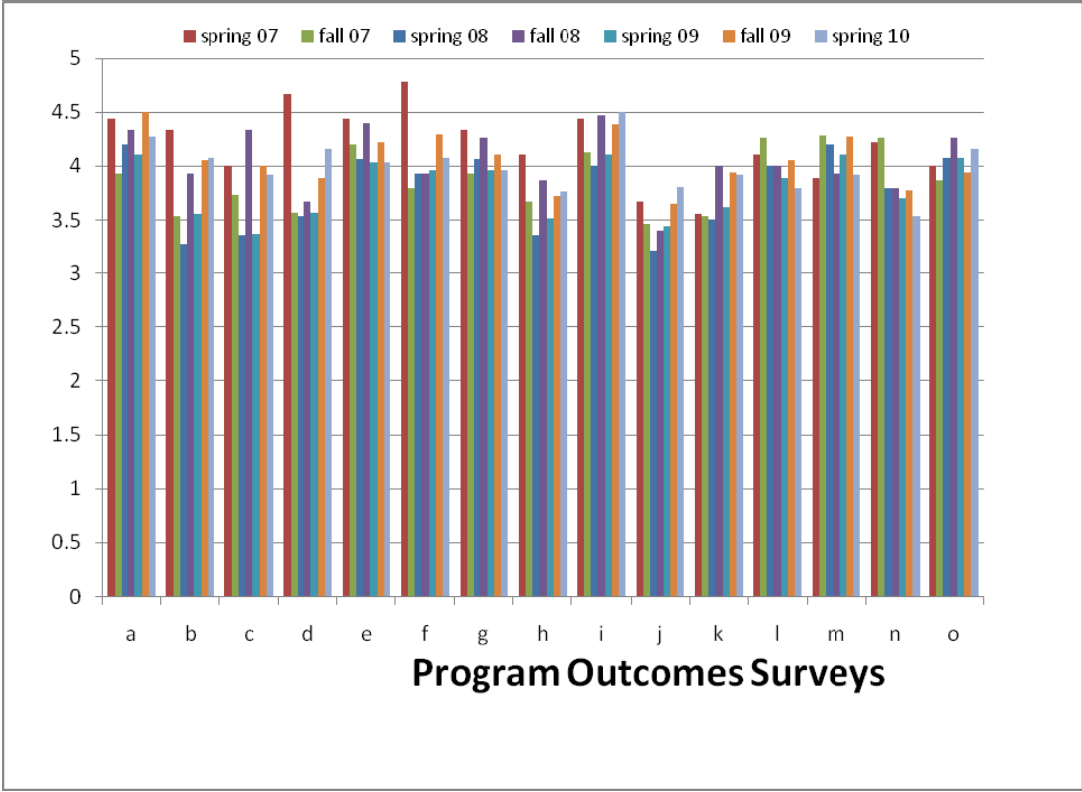
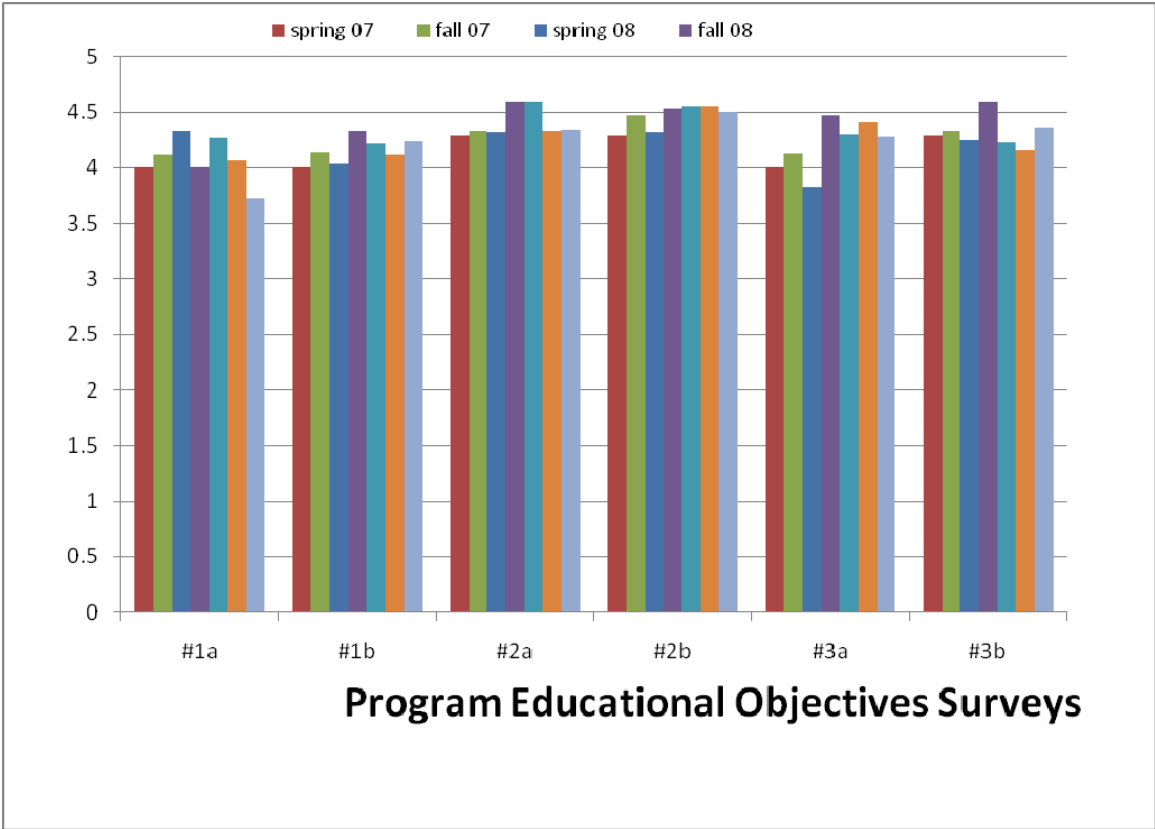
OUTCOMES & OBJECTIVES SURVEYS: The results of the quantitative outcomes and objectives surveys are attached. This is the second semester using the slightly changed wording that we decided upon in the discussion of the Spring 09 Exit Interviews for Outcomes Assessment. Our new wording is "Rate ... your proficiency or preparation ..."

some responses under “What did you especially like about the program?”

senior design, students form a community, SAE Baja, faculty made subjects interesting, senior design, small student: teacher ratio, aerospace classes, new bldg, small classes, professors, intimate size, aerodynamics classes, broad, theoretical coursework, internship opportunities, balanced curriculum, sr design, interaction w/ professors, learned a lot, small class sizes, avail. professors, faculty & curriculum, personal relationship w/ faculty, personal, small, liked instructors, students relate well together, great teachers, working with people, thermal science classes, senior design, physics, 1503, labs, statics and dynamics, class size, friendships, teachers willing to help, plenty of resources to help succeed

some responses under “What did you especially dislike about the program?”

social life, chem 301, need more MATLAB, few technical electives, FE review needed, mechatronics, chem 301, senior design, few tech electives, need mfg./biotech classes, int. dynamics, matl science, tech electives mostly aero, not enough CAD, need more hands-on, need more labview, need FEA, last minute schedule changes, senior design, intermediate dynamics, matl science, lack of sleep, lack of MATLAB and inventor, need more technical electives, need more programming, controls, writing portfolio, humanities classes



MAE Faculty Meeting

Tuesday, 14 September 2010

Review of Exit Interview Results (Spring 2010 semester)

Present: Albertson, Calvisi, Gorder, Ketsdever, Lauderbaugh, Stevens, Sooklal, Tragesser, Webb

(1) As the program grows, how do we maintain small class sizes? Discussion: still an attractive feature of our department from exit interviews, offering every required class every semester, now, can split into multiple sections if we need to, already in multiple sections in size-limited labs, something to watch if that is positive feature.

(2) items L, M, N are low—students unhappy with classes outside our department, math, etc? Discussion: perhaps downgrading on “proficiency” based on our wording changes, Julie recommend 5011 to students, many ug students do well, like, 5011, sometimes students claim that they don’t remember math, statistics, so they can get a review.

(3) technical electives sufficient? Biomass and Medical Device Design both cancelled this semester for low enrollment, Julie will offer Biomass in spring at better time, student demand for FEA, Val gives a little bit of FEA in Machine Design, student demand (anecdotal) is for more, Georg was going to offer TE in FEA this fall, but of course..., possible in future.

(4) general enrollment fluctuations? could have to do with non-standard summer schedule, curriculum committee will take on drawing up a standard schedule as starting basis for all summers.

Appendix F-9

Fall 2010 Exit Interviews – Summary

I had exit interviews with 19 students. The average GPA was 3.00 with a high of 3.80 and low of 2.17.

JOBS: At the time of the interviews in mid-November, 6 of the 19 students had jobs lined up, and three students were planning to go to graduate school (one at UCCS). The remainder were actively looking for engineering jobs. Employers included CS Utilities, NAVSYS, Bechtel, Goodrich, and Northrop.

COMMENTS: Positive comments continued to include topics like small classes and engaged professors. Interestingly, many students commented that they liked the hands-on nature of the curriculum where that (the lack) had been a criticism some years in the past. Many students liked the aero minor while others continued to bemoan a lack of non-aero technical electives. This time I specifically asked those students about the non-aero electives that we had offered and had to cancel for low enrollment. The reply was generally along the lines of the classes not fitting their schedules and/or particular interests...

OTHER: Most students came to UCCS because they were living locally—Colorado Springs, Pueblo, Woodland Park, etc. Some were attracted by the program reputation, the campus tours, or came because of parental pressure.

OUTCOMES & OBJECTIVES SURVEYS: The results of the quantitative outcomes and objectives surveys are attached. This is the third semester using the slightly changed wording that we decided upon in the discussion of the Spring 09 Exit Interviews for Outcomes Assessment. Our new wording is “Rate ... your proficiency or preparation ...”

some responses under “What did you especially like about the program?”

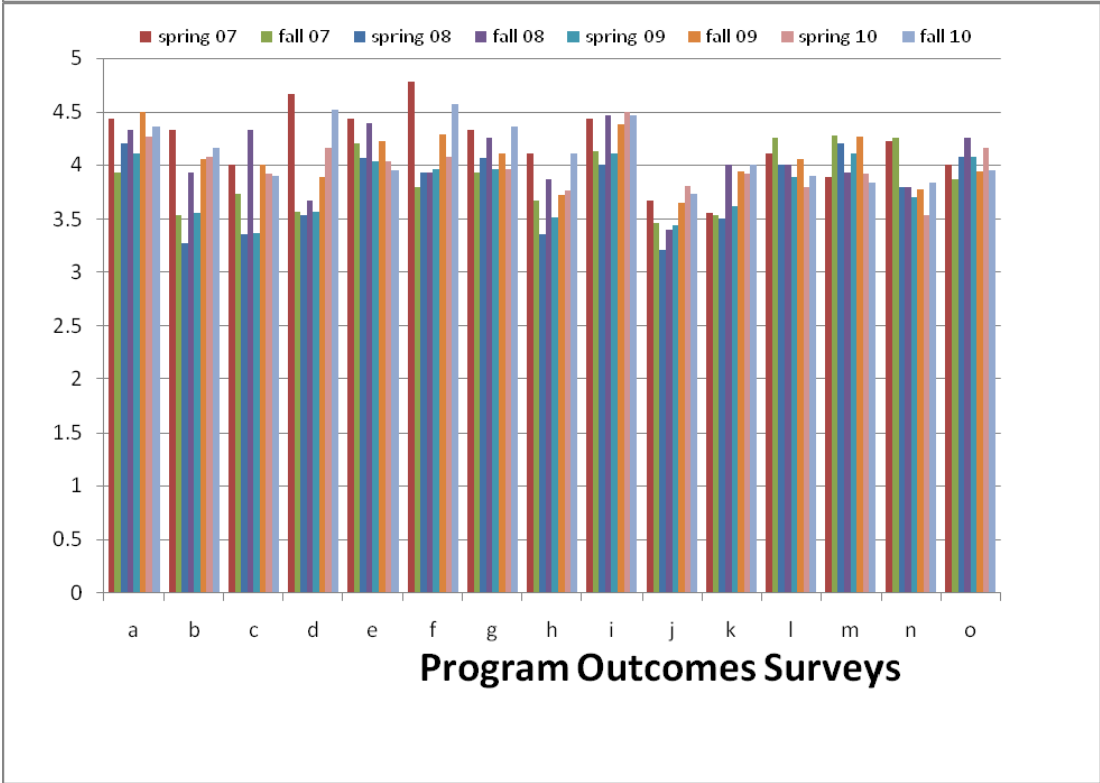
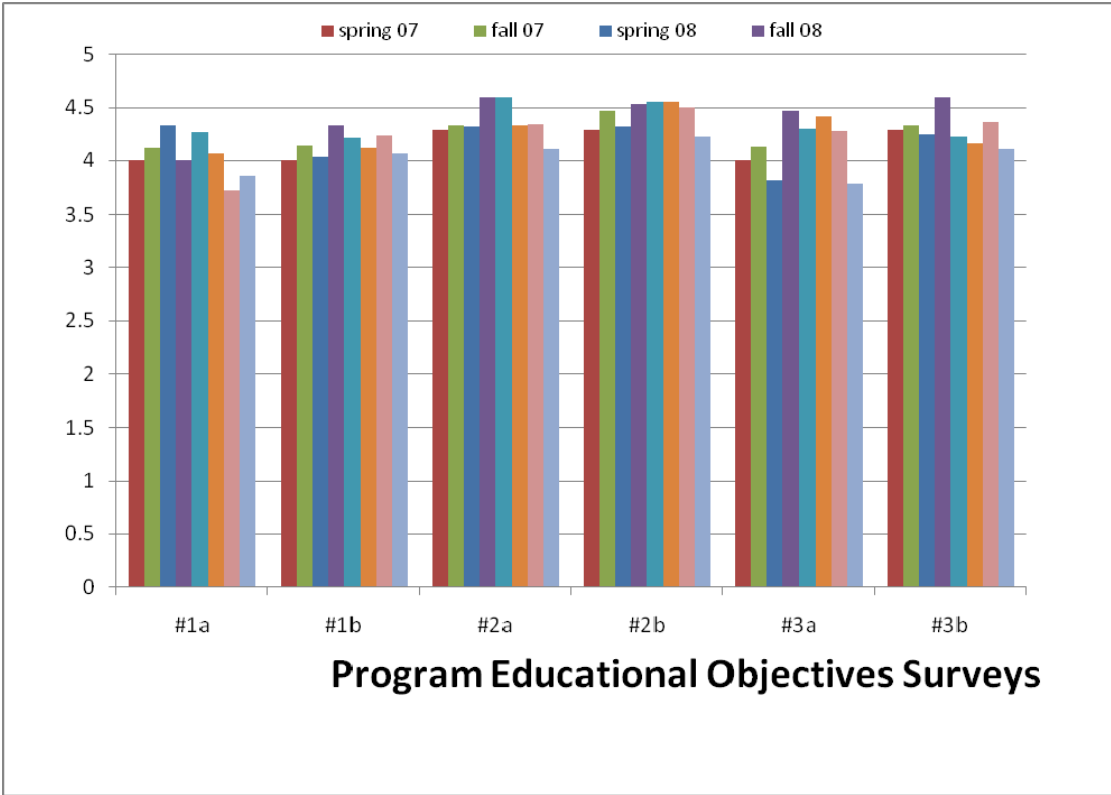
design classes, senior design project; small community, good teachers and classes, good senior design; hands on applications, dynamics and controls; examples of real-life applications; everything; hands on classes, technical reports, senior design, group work; flexible, quick to get through; interesting; wide variety of classes; challenging; aero minor, aero teachers; small classes; teams, helpful instructors, challenge; know all professors, professors commitment to improvement; hands on projects; energy and experience of professors; challenging; thermodynamics

some responses under “What did you especially dislike about the program?”

limited minors, limited non-aero electives ; too much theory, need internships provided; not enough elective classes; hard to find help with classes; inconsistent grading between professors; challenging, used up free time; no connection between school and engineering field; not enough minority faculty; too much thermal science; scheduling; classes all over campus, need more Solidworks, MATLAB; too many aero tech electives; unprepared lab instructors; rusty basics were hard to refresh;

other comments

wished for engineering economy; need more non-aero technical electives, need to have an FE review course; liked Sr. Design; overall good program; overall good program; more help finding internships; liked Machine Design II; add economics as option for business electives; class scheduling needs to avoid conflicts with other departments; easy to game the GPA by looking for easy professors



MAE Faculty Meeting

Tuesday, 8 February

Review of Exit Interview Results (Fall 2010 semester)

Present: Albertson, Gorder, Ketsdever, Lauderbaugh, Stevens, Sooklal, Tragesser, Webb, Lilly

(1) Student comment noted on insufficient minority faculty.

(2) The issue of students wanting non-aero technical electives was revisited. Several classes that have been offered have been cancelled for low enrollment. Peter asked about scheduling selection. After discussion, he suggested instead of avoiding conflicts with aero-minor classes, that the non-aero classes might be scheduled at the same times: i.e. if the aero classes have robust enrollments, there must not be other conflicts, and it would force the students to choose. There was discussion about the number and percentage of aero minors that are in the program. The point was made that there are students who declare the minor, but never go on to complete it, and students who take the classes before declaring the minor, and students who take some of the classes and never go on to declare nor pursue the minor. Julie later verified the current number of declared aero minor students is 37. There was further discussion around the usefulness/validity of polling students for preferences on technical electives, since the technical electives that were cancelled polled as being the most popular. It was noted that in the past, undergraduate students have enrolled in graduate engineering analysis, that CFD is packed, many of whom are undergraduates, and that rocket propulsion has a significant number of undergraduates this semester.

(3) There was discussion of the trends on average semester GPA. It was noted that it has been decreasing lately. It was also noted that fall semester averages are uniformly lower for the limited sample that we have (3 pairs) than the corresponding spring semester. There was discussion about reasons for this, and the influence on the average of single students on the relatively small semester class sizes (typically 20-3) involved.

(4) Further discussion centered around students' reasons for coming to UCCS including parental influence. There have been cases where students were required (by parents) to attend UCCS in spite of student wishes, and many cases where students were strongly encouraged to come here. Our role as faculty in orientation sessions, college open houses, freshman welcome, and other venues where parents are present was discussed. Appeal of the program to both students and their parents was discussed—in most cases, the appeal would be parallel if not identical. Department participation in open house and other events has been very good.

Appendix F-10

Spring 2011 Exit Interviews – Summary

I conducted 22 exit interviews with graduating seniors. There were a couple of seniors who are graduating this semester rather than last because of a failed class, but I had interviewed them and collected their exit surveys last semester. I did not repeat exit interviews with them.

The average GPA was 3.08 with a high of 3.97 and low of 2.19.

JOBS: At the time of the exit interviews (early April) plans following graduation were as follows:

5 —intended to attend graduate school, 3 of these are entering our graduate program at UCCS

10 —actively seeking work, most of these would take a job anywhere, a few were restricting their search to the front range or to Colorado Springs, one wanted to go anywhere except Colorado Springs

4 —had firm positions in place: US Army, US Marine Corps, OTC, ITT—of these, only the ITT position would be engineering work

3 —not looking for work—planning to take 6 months to a year off for various reasons before looking for a job

PROFESSIONAL INVOLVEMENT: Curiously, on our exit survey, every single student this time indicated that they planned to be involved in a professional society following graduation. The percentage is normally high, but I don't think that I've ever seen it at 100%. It is even more interesting this semester because a fair percentage of the graduates are not immediately pursuing a career in engineering...

COMMENTS: We continue to get positive comments about small class sizes and helpful professors. We also got a number of favorable comments about “hands-on” experience, which has been a weak point in the past. There were also several comments about not enough “real world” experience.

OTHER: Another interesting point: eight of the 22 students came to UCCS either by transferring from Boulder, Mines, or CSU, or else because they were not admitted to their first choice school. Some who transferred were put off by the atmosphere, academic and otherwise, of the larger schools and were very pleased with the difference at UCCS. As usual, most students came to UCCS because they were living locally. Several students mentioned smaller size as one of the main things that attracted them to UCCS.

OUTCOMES & OBJECTIVES SURVEYS: The results of the quantitative outcomes and objectives surveys are attached. This is the fourth semester using the slightly changed wording for the Program Outcomes. Our new wording is “Rate ... your proficiency or preparation ...”

Also, this is the first semester results with the exit survey reflecting the changes to Program Outcomes 1-o.

responses to the question about the most significant problem facing the world:
alternative/renewable energy; solar energy; medical breakthroughs; alternative energy;
sustainable/renewable energy; energy crisis; fossil fuels; excessive energy consumption;
neglect; money; energy conservation; renewable energy; energy production;
environment; green technology; improve things with safety; energy; nuclear waste; cost
of energy; energy resources; better source of energy; optimize performance; not looking
for new ideas

responses under “What did you especially like about the program?”

broad range of topics, hands-on experience; one-on-one help from professors, flexibility
in scheduling, BS/MS, URS; variety of topics, instructor helpfulness; hands-on and
design focus; able to complete it, expected and received 5 years of hell and I'm glad it's
over with; enjoyed entire program, helpful professors; helpful professors; small
environment, mini baja; community aspect, accessibility of professors; build things, heat
and mass, new engineering building; BS/MS opportunity, interested professors,
professors willing to help; small size, program pushes students, prepares them well;
friendly, fair faculty, curriculum makes sense; hands-on labs, senior design; variety of
topics; upper level courses; small class sizes; small class sizes, camaraderie; team
projects; mechanical systems; good teachers, group advising

responses under “What did you especially dislike about the program?”

too frequent changes; wider area of concentrations needed among professors; not enough
exposure to companies; poor quality of team members in group projects; book prices,
workloads, bad teachers, hard teachers, early morning classes, english majors in the
engineering building; Mod/Sim, Machine Design 2; not enough hands-on experiences;
senior design; MATLAB class not helpful, Mechatronics, computer lab; not learning
AutoCad; don't know where to go after school; need MATLAB, drafting, better lab
computers; lack of real-world problems; limited technical electives; gpa doesn't reflect
knowledge; mechatronics; relative lack of industry exposure; need more technical
electives, writing; more real-life projects; not enough engineering electives; not enough
real-world applications

alumni surveys

I've also included the results of the alumni surveys that are conducted each year.

The alumni survey is very similar to the quantitative part of the exit survey, with the wording changed appropriately to ask about alumni's views of program outcomes in retrospect, and their current views of educational objectives.

The sample sizes are much smaller for the alumni surveys (8, 3, 8, 7, respectively, for the 4 years presented).

* The results of the questions regarding program educational objectives are largely similar to those of the exit survey, though slightly higher. I'm not sure that that is significant given the sample sizes involved.

*The results of the questions about program outcomes are also mostly similar to those of the exit survey with the following exceptions:

-- The fourth question regarding, "ability to function on multi-disciplinary teams," was ranked slightly higher by the alumni than by the graduates. This suggests that they may have found that they were better equipped to function on teams than they anticipated at graduation.

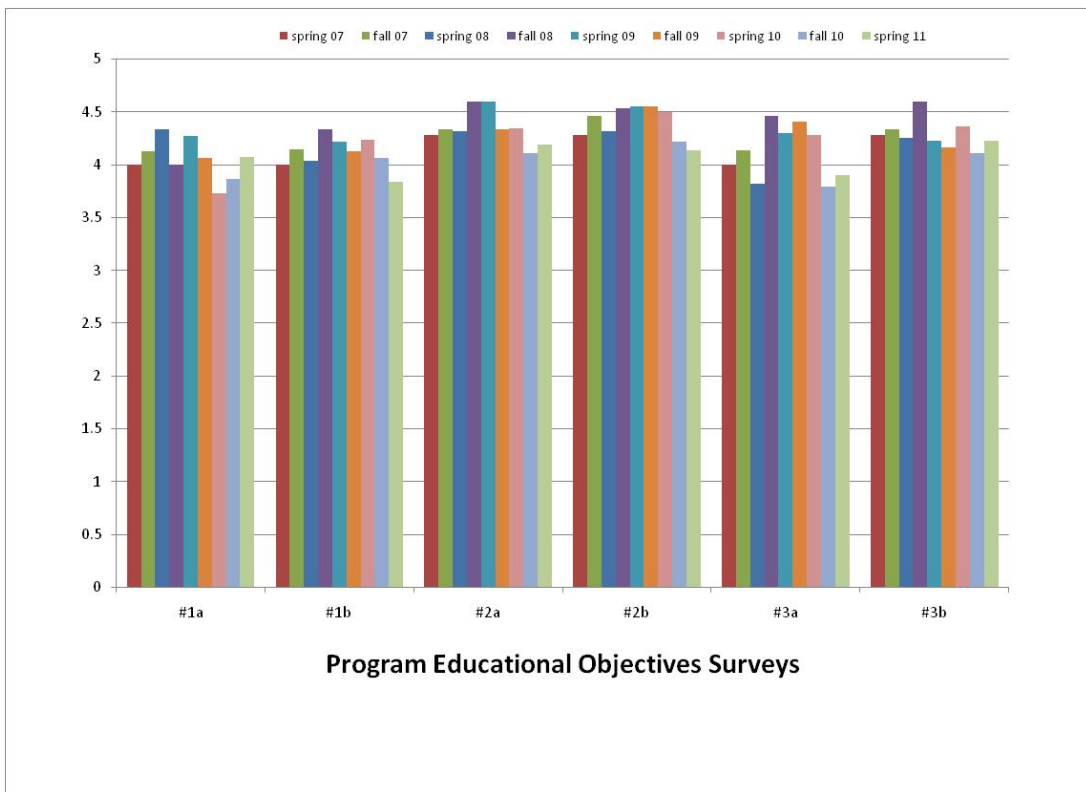
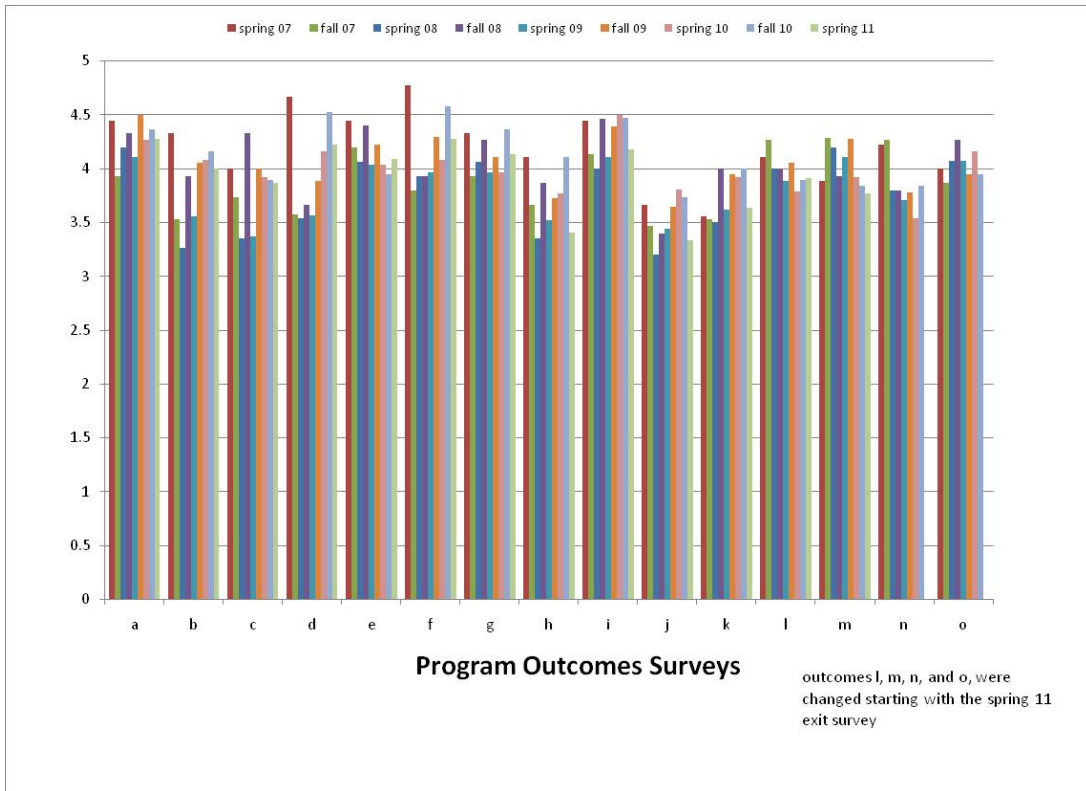
-- Graduating seniors gave higher rankings than alumni on these two questions:

"understanding of professional and ethical responsibility"

"an ability to apply principles of engineering, basic science, and to model, analyze, design, and realize physical systems, components or processes"

Possibly graduates found that they were not as prepared as anticipated in these areas.

As with the results of the program educational objectives, the results were very similar, and the slight differences may not be too meaningful.



Faculty discussion of Spring 2011 Exit Interviews will occur at the first faculty meeting of the Fall 2011 semester

Appendix G-1. Alumni Survey
UCCS Mechanical and Aerospace Engineering Department
Alumni Survey

(an online version of this survey can be reached from <http://www.surveymonkey.com/s/XPHBBMK> if you prefer to fill it out that way)

year and semester of graduation: spring/summer/fall 20__

How many professional organizations (ASME, AIAA, etc.) have you participated in since graduation? _____

How much continued education or training have you engaged in since graduation?

formal (grad school, company training programs, professional training etc.)

informal (mentored work, on-the-job training, self-study, etc.)

How long did you remain (or do you anticipate remaining) in a job with primary engineering tasks and responsibility (before moving into a non-engineering career, or an administrative position w/out engineering responsibility)? _____yrs

MAE Department Objectives

Please rate yourself relative to other engineers with whom you are acquainted:

ability to use mechanical engineering principles, proficiencies and technical information

inadequate 1 2 3 4 5 outstanding

ability to continue growth and development as an engineer

inadequate 1 2 3 4 5 outstanding

ability to contribute to engineering problem solving and to fulfill professional responsibilities

inadequate 1 2 3 4 5 outstanding

MAE Department Outcomes

Please rate yourself on how prepared you now feel that you were *at graduation* in the following areas:

1=poor, 2=needs improvement, 3=fair, 4=good, 5=outstanding, NA=not applicable/don't know

___ ability to apply knowledge of mathematics, science, and engineering

___ ability to design and conduct experiments, as well as to analyze and interpret data

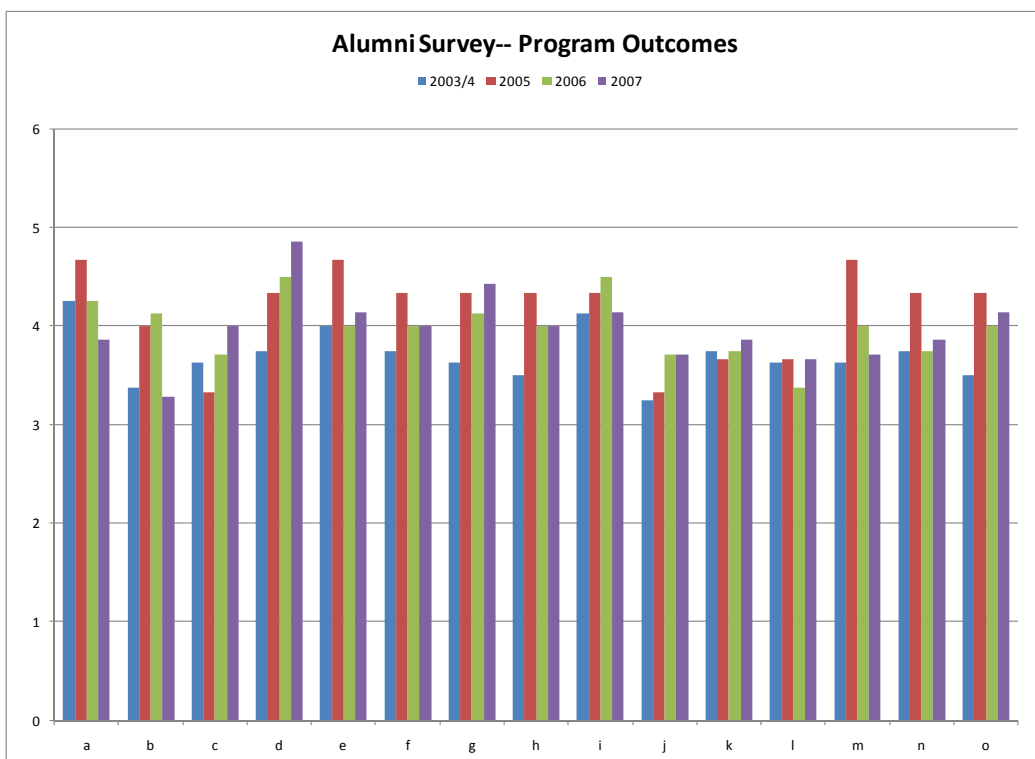
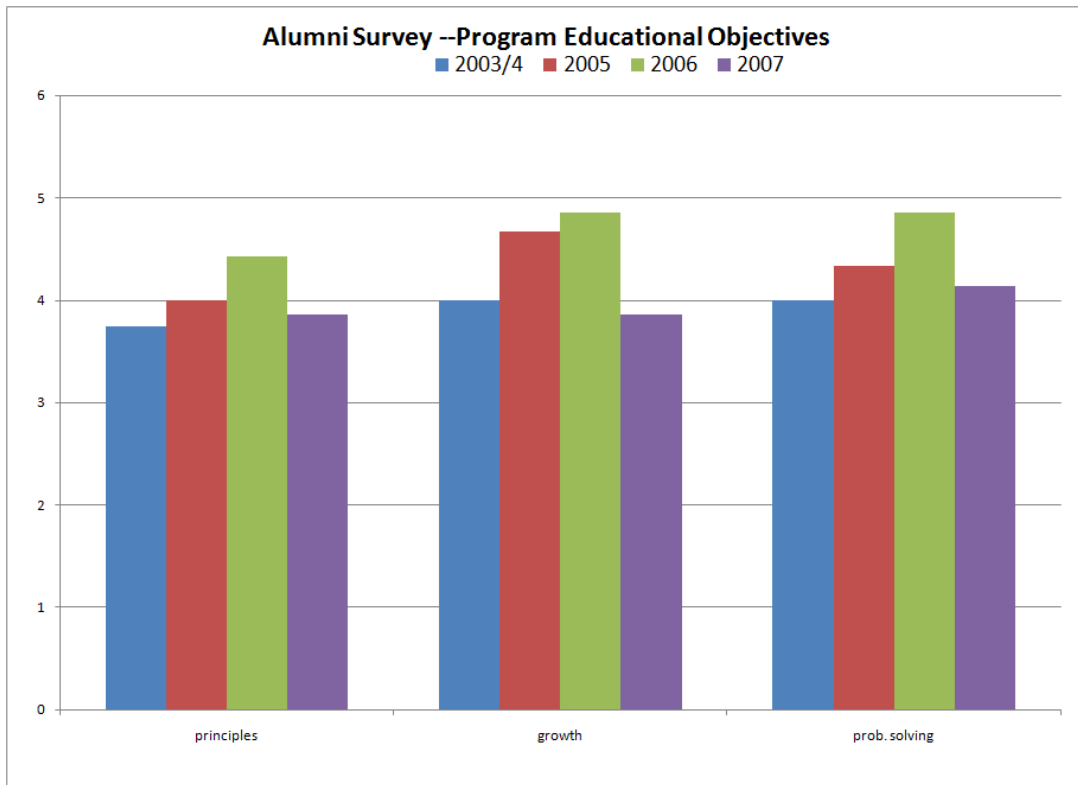
___ ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

___ ability to function on multi-disciplinary teams

___ ability to identify, formulate, and solve engineering problems

- ___ understanding of professional and ethical responsibility
 - ___ ability to communicate effectively
 - ___ possess the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
 - ___ recognition of the need for, and an ability to engage in life-long learning
 - ___ knowledge of contemporary issues
 - ___ ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
 - ___ an ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
 - ___ preparation to work professionally in both thermal and mechanical systems areas
- please add any other comments that would help us improve our program on the back*

Appendix G-2 Alumni Survey Results



Appendix H-1. Mapping Between Undergraduate Courses and Student Outcomes

Course #	Course Name	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.
MAE 1502	Principles of Engineering	X				X	X		X		X	X		
MAE 2103	Engineering Mechanics I	X				X						X		
MAE 2200	Materials Engineering	X	X			X						X	X	X
MAE 3055	MechEtronics II	X	X	X	X		X	X				X		
MAE 3201	Strength of Materials	X		X		X				X		X	X	X
MAE 3302	Engineering Thermodynamics II	X		X		X				X		X	X	X
MAE 3310	Heat and Mass Transfer	X				X		X			X	X	X	X
MAE 3311	Heat and Mass Transfer Lab	X	X			X		X				X		X
MAE 3401	Modeling and Simulation of ...	X				X						X	X	
MAE 4120	Machine Design II	X				X						X	X	
MAE 4402	Intermediate Dynamics	X				X						X	X	
MAE 4510	Engineering Design I	X	X	X	X	X	X	X	X	X	X	X	X	X
MAE 1503	Introduction to Engineering Design	X		X	X	X	X	X	X	X		X		
MAE 2055	MechEtronics I	X				X						X		
MAE 2104	Engineering Mechanics II	X				X						X	X	
MAE 2301	Engineering Thermodynamics I	X				X						X	X	
MAE 3005	Engineering Measurement Lab	X	X		X	X		X			X	X	X	
MAE 3130	Fluid Mechanics	X				X		X				X	X	X
MAE 3131	Fluid Mechanics Lab	X	X			X		X				X		X
MAE 3501	Machine Design I	X				X						X		
MAE 4421	Automatic Controls of Aero/Mech ...	X	X	X		X		X	X			X	X	X
MAE 4511	Engineering Design II	X	X	X	X	X	X	X	X	X	X	X	X	X

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) an ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes
(m) preparation to work professionally in both thermal and mechanical systems areas

**Appendix H-2 Assessment Presentations for MAE 3310 Heat and Mass Transfer:
Years 2007 through 2010**

2007: MAE 3310 Heat and Mass Transfer



**MAE 3310
Heat and Mass Transfer**

Course Assessment: May 15th, 2007
Course Lead Instructor: Julie Albertson

Term: Spring 2007

Overall Standing		
	Assessment	Performance
Before	●	●
Now	●	●

Department of Mechanical and Aerospace Engineering
University of Colorado at Colorado Springs



Catalog Description and Linkages

- “The principles of heat transfer: conduction, convection, and radiation; steady-state and transient conduction, thermal contact resistance, insulation, heat capacity; forced and natural convection, velocity and thermal boundary layers, fluid flow; radiation from blackbodies, surfaces and the sun.”

Prerequisites:

- ③ Math 313 Linear Algebra
- ③ Math 340 Differential Equations
- ② MAE 2301 Thermodynamics
- ① Engrl 309 Technical Communication

Course Outcomes: By successfully completing this course, the student will be able to:

- ❖ Demonstrable fundamental knowledge of conduction, convection and radiation heat transfer:
 - ◆ provide accurate explanation of heat transfer modes, properties, terms and concepts.
 - ◆ produce correct solutions to a variety of textbook problems.
- ❖ Demonstrable ability to solve engineering problems involving conduction, convection, and radiation:
 - ◆ produce and solve models for thermal-fluid systems involving heat transfer for spatial and temporal responses.
 - ◆ perform analyses to determine the affects of system parameters.
- ❖ Demonstrable ability to produce professional engineering work

Level ①: Exposure; vocabulary; qualitative and quantitative understanding
 Level ②: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems
 Level ③: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems





Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓	Department Outcomes ⇒	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Demonstrable fundamental knowledge of conduction, convection and radiation heat transfer: a. provide accurate explanation of heat transfer modes, properties, terms and concepts. b. produce correct solutions to a variety of textbook problems.		X				X						X	X			
Demonstrable ability to solve engineering problems involving conduction, convection, and radiation: a. produce and solve models for thermal-fluid systems involving heat transfer for spatial and temporal responses. b. perform analyses to determine the affects of system parameters.		X				X						X	X	X	X	
Demonstrable ability to produce professional engineering work								X	X		X					X

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- e) An ability to identify, formulate, and solve engineering problems.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 3310: Heat and Mass Transfer

uccs.edu



Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to apply knowledge of mathematics, science, and engineering.	1. Weekly homework 2. Finite Difference Project	● ●	HW PR, CS
An ability to identify, formulate, and solve engineering problems.	1. Ill-defined problems on homework 2. Mini design projects	● ●	HW PR, CS
An ability to communicate effectively	1. Solar energy application project (Individual) 2. In class application briefings	● ●	O, CS, R O, P, R
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	1. Solar energy application project 2. Weekly heat transfer application readings and discussions	● ●	CS, R O
A knowledge of contemporary issues.	1. Weekly explanation of current heat transfer applications. 2. Solar energy application project	● ●	O R, CS

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	1. Mini design projects 2. In class application exercises 3. Finite difference project	● ● ●	PR, O O CS
A knowledge of chemistry and calculus-based physics with a depth in physics	1. Homework	●	HW
An ability to apply advanced mathematics	1. Homework 2. Finite difference project 3. Solar Application project calculations	● ●	HW (DFQ) CS PR, CS
Familiarity with statistics and linear algebra	1. Solar energy application project 2. Space shuttle tile finite difference project	● ●	PR, CS CS
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems	Solar energy project	●	

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Spring 2007)	Action (Spring 2008)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.	●	●	Students perform poorly using differential equations	System-wide remedial training Additional homework applying DFQ to heat and mass	TBD
An ability to identify, formulate, and solve engineering problems.	●	●			
An ability to communicate effectively	●	●			
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	●	●			
A knowledge of contemporary issues.	●	●			

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Spring 2007)	Action (Spring 2008)	Impact of Action
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Green	Green			
A knowledge of chemistry and calculus-based physics with a depth in physics	Green	Green			
An ability to apply advanced mathematics	Green	Yellow	Students perform poorly using differential equations	System-wide remedial training Additional homework applying DFQ to heat and mass	TBD
Familiarity with statistics and linear algebra	Green	Green			
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems	Green	Yellow	Students need additional project experience	More small projects, and additional one that threads throughout the semester	TBD

2008: MAE 3310 Heat and Mass Transfer



UNIVERSITY OF COLORADO AT COLORADO SPRINGS

MAE 3310 Heat and Mass Transfer

Course Assessment: September 29th, 2008

Course Lead Instructor: Julie Albertson

Term: Spring 2008

Overall Standing		
	Assessment	Performance
Before		
Now		

Department of Mechanical and Aerospace Engineering
University of Colorado at Colorado Springs

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UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Catalog Description and Linkages

- "The principles of heat transfer: conduction, convection, and radiation; steady-state and transient conduction, thermal contact resistance, insulation, heat capacity; forced and natural convection, velocity and thermal boundary layers, fluid flow; radiation from blackbodies, surfaces and the sun."

Prerequisites:

- ③ Math 313 Linear Algebra
- ③ Math 340 Differential Equations
- ③ MAE 3130 Fluid Mechanics*
- ② MAE 2301 Thermodynamics
- ① Engl 309 Technical Communication

*New prerequisite to be implemented this academic year.

Course Learning Objectives:

- ◆ By the completion of this course, students will be expected to be able to:
- ◆ Correctly identify the mode of heat transfer.
- ◆ Solve both steady and transient heat conduction equations.
- ◆ Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.
- ◆ Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.

Level ①: Exposure; vocabulary; qualitative and quantitative understanding

Level ②: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems

Level ③: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems

MAE 3310: Heat and Mass Transfer

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Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓	Department Outcomes ⇒	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Correctly identify the mode of heat transfer.		X				X										
Solve both steady and transient heat conduction equations.		X				X		X				X				
Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.											X			X		
Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.		X				X							X			

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- e) An ability to identify, formulate, and solve engineering problems.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to apply knowledge of mathematics, science, and engineering.	1. Weekly homework 2. Finite Difference Project 3. Quizzes - conceptual	● ● ●	HW PR, R EX
An ability to identify, formulate, and solve engineering problems.	1. Weekly homework 2. Exams	● ●	HW EX
An ability to communicate effectively	1. Technical brief on finite difference project	●	PR, R
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.			
A knowledge of contemporary issues.	1. Handouts from technology quarterly of The Economist 2. Examples in class	● ●	O O

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	1. Finite difference project - MATLAB	●	PR, R
A knowledge of chemistry and calculus-based physics with a depth in physics	1. Homework 2. Exams	● ●	HW EX
An ability to apply advanced mathematics	1. Homework 2. Finite difference project 3. Exams	3x ●	HW PR, R EX
Familiarity with statistics and linear algebra			
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems			

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets;
HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Spring 2007)	Action (Spring 2008)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.	●	●	Students perform poorly using differential equations	System-wide remedial training Class time reviewing basics	Still an issue
An ability to identify, formulate, and solve engineering problems.	●	●			
An ability to communicate effectively	●	●			
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	●	●			
A knowledge of contemporary issues.	●	●			

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Spring 2007)	Action (Spring 2008)	Impact of Action
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Green	Green			
A knowledge of chemistry and calculus-based physics with a depth in physics	Green	Green			
An ability to apply advanced mathematics	Green	Yellow	Students perform poorly using differential equations	System-wide remedial training Class time reviewing basics	Still an issue
Familiarity with statistics and linear algebra					
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems	Green	Yellow	Students need additional project experience	More small projects, and additional one that threads throughout the semester	TBD

2009: MAE 3310 Heat and Mass Transfer



UNIVERSITY OF COLORADO AT COLORADO SPRINGS

MAE 3310 Heat and Mass Transfer

Course Assessment: October 08th, 2009

Course Lead Instructor: Julie Albertson

Term: Spring 2009

Overall Standing		
	Assessment	Performance
Before		
Now		

Department of Mechanical and Aerospace Engineering
University of Colorado at Colorado Springs

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UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Catalog Description and Linkages

- "The principles of heat transfer: conduction, convection, and radiation; steady-state and transient conduction, thermal contact resistance, insulation, heat capacity; forced and natural convection, velocity and thermal boundary layers, fluid flow; radiation from blackbodies, surfaces and the sun."

Prerequisites:

- ③ Math 313 Linear Algebra
- ③ Math 340 Differential Equations
- ③ MAE 3130 Fluid Mechanics*
- ② MAE 2301 Thermodynamics
- ① Engl 309 Technical Communication

*New prerequisite to be implemented this academic year.

Course Learning Objectives:

- ◆ By the completion of this course, students will be expected to be able to:
- ◆ Correctly identify the mode of heat transfer.
- ◆ Solve both steady and transient heat conduction equations.
- ◆ Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.
- ◆ Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.

Level ①: Exposure; vocabulary; qualitative and quantitative understanding

Level ②: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems

Level ③: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems

MAE 3310: Heat and Mass Transfer

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Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓	Department Outcomes ⇒														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Correctly identify the mode of heat transfer.	X				X										
Solve both steady and transient heat conduction equations.	X				X	X					X				
Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.										X			X		
Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.	X				X							X			

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- e) An ability to identify, formulate, and solve engineering problems.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to apply knowledge of mathematics, science, and engineering.	<ol style="list-style-type: none"> Weekly homework Projects Quizzes - conceptual 	●	HW PR, R EX
An ability to identify, formulate, and solve engineering problems.	<ol style="list-style-type: none"> Weekly homework Exams 	●	HW EX
An ability to communicate effectively	<ol style="list-style-type: none"> Written communication – project reports 	●	PR, R
A knowledge of contemporary issues.	<ol style="list-style-type: none"> Handouts from Skunkworks Examples incorporated into lecture Solar energy systems lecture 	●	O O

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	1. Projects – Excel, MATLAB 2. HW - MATLAB	●	PR, R
A knowledge of chemistry and calculus-based physics with a depth in physics	1. Homework 2. Exams	●	HW EX
An ability to apply advanced mathematics	1. Homework 2. Project 3. Exams	●	HW PR, R EX
Familiarity with statistics and linear algebra			

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Spring 2007)	Action (Spring 2008)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.	●	●	Students perform poorly using differential equations	System-wide remedial training Additional homework applying DFQ to heat and mass	This small, talented class did not have problems with math
An ability to identify, formulate, and solve engineering problems.	●	●			
An ability to communicate effectively	●	●		PROBLEM – bad written communication skills	
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	●	●			
A knowledge of contemporary issues.	●	●			

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Spring 2007)	Action (Spring 2008)	Impact of Action
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.					
A knowledge of chemistry and calculus-based physics with a depth in physics					
An ability to apply advanced mathematics			Students perform poorly using differential equations	System-wide remedial training Additional homework applying DFQ to heat and mass	This small, talented class did not have problems with math
Familiarity with statistics and linear algebra					
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems			Students need additional project experience	More small projects, and additional one that threads throughout the semester	Small projects integrated, better engagement of larger portion of population

2010: MAE 3310 Heat and Mass Transfer



UNIVERSITY OF COLORADO AT COLORADO SPRINGS

MAE 3310 Heat and Mass Transfer

Course Assessment: February 22nd, 2011

Course Lead Instructor: Julie Albertson

Term: Fall 2010

Overall Standing		
	Assessment	Performance
Before		
Now		

Department of Mechanical and Aerospace Engineering
University of Colorado at Colorado Springs

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UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Catalog Description and Linkages

- "The principles of heat transfer: conduction, convection, and radiation; steady-state and transient conduction, thermal contact resistance, insulation, heat capacity; forced and natural convection, velocity and thermal boundary layers, fluid flow; radiation from blackbodies, surfaces and the sun."

Prerequisites:

- ③ Math 313 Linear Algebra
- ③ Math 340 Differential Equations
- ③ MAE 3130 Fluid Mechanics
- ② MAE 2301 Thermodynamics

Course Learning Objectives:

- ◆ By the completion of this course, students will be expected to be able to:
- ◆ Correctly identify the mode of heat transfer.
- ◆ Solve both steady and transient heat conduction equations.
- ◆ Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.
- ◆ Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.

Level ②: Exposure; vocabulary; qualitative and quantitative understanding

Level ③: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems

Level ④: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems

MAE 3310: Heat and Mass Transfer

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Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓	Department Outcomes ⇒														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Correctly identify the mode of heat transfer.	X				X										
Solve both steady and transient heat conduction equations.	X				X	X					X				
Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.										X			X		
Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.	X				X							X			

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- e) An ability to identify, formulate, and solve engineering problems.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to apply knowledge of mathematics, science, and engineering.	<ol style="list-style-type: none"> Weekly homework Projects Quizzes - conceptual 	●	HW PR, R EX
An ability to identify, formulate, and solve engineering problems.	<ol style="list-style-type: none"> Weekly homework Exams 	●	HW EX
An ability to communicate effectively	<ol style="list-style-type: none"> Written communication – project reports 	●	PR, R
A knowledge of contemporary issues.	<ol style="list-style-type: none"> Handouts from Skunkworks Examples incorporated into lecture Solar energy systems lecture 	●	O O

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	1. Projects – Excel, MATLAB 2. HW - MATLAB	●	PR, R
A knowledge of chemistry and calculus-based physics with a depth in physics	1. Homework 2. Exams	●	HW EX
An ability to apply advanced mathematics	1. Homework 2. Project 3. Exams	●	HW PR, R EX
Familiarity with statistics and linear algebra	1. Projects (linear algebra)	●	PR

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2009)	Action (Fall 2010)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.	●	●		Will continue Gateway Exam	
An ability to identify, formulate, and solve engineering problems.	●	●			
An ability to communicate effectively	●	●			
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	●	●			
A knowledge of contemporary issues.	●	●			

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2009)	Action (Fall 2010)	Impact of Action
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.					
A knowledge of chemistry and calculus-based physics with a depth in physics					
An ability to apply advanced mathematics					
Familiarity with statistics and linear algebra					
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems			Students still need work on actual engineering applications	More ill-defined, outside the box projects – added one additional project.	Some improvement in ability to define problem and solution process.

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2010)	Action (Fall 2011)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.					
An ability to identify, formulate, and solve engineering problems.					
An ability to communicate effectively					
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.					
A knowledge of contemporary issues.					

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2010)	Action (Fall 2011)	Impact of Action
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.					
A knowledge of chemistry and calculus-based physics with a depth in physics					
An ability to apply advanced mathematics					
Familiarity with statistics and linear algebra					
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems			Students still need work on actual engineering applications	Suggest more ill-defined, outside the box projects	

Appendix H-3 Assessment Presentations for the Single Year 2010: Various Classes

2010: MAE 1502 Principles of Engineering



MAE 1502 Principles of Engineering

Course Assessment: February 22nd, 2011
Course Lead Instructor: Julie Albertson

Term: Fall 2010

Overall Standing		
	Assessment	Performance
Before		
Now		

Department of Mechanical and Aerospace Engineering
University of Colorado at Colorado Springs

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Catalog Description and Linkages

- "Introduces the field of engineering. Explores various technology systems and manufacturing processes to demonstrate how engineers use math, science, and technology in an engineering problem solving process. The course also includes an examination of social and political implications of technology."

Prerequisites:

- ② High school diploma

Course Outcomes: By successfully completing this course, the student will be able to:

- ◆ Conceptually understand the principles of engineering.
- ◆ Apply practical laboratory experiences in order to facilitate conceptual understanding of engineering.
- ◆ Understand and practice engineering professionalism and teamwork, with a focus on applicable ethnic and gender issues.

Target Courses:

- ① MAE 2103 Engineering Mechanics I

Level ①: Exposure, vocabulary; qualitative and quantitative understanding

Level ②: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems

Level ③: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems

MAE 1502: Principles of Engineering

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Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓	Department Outcomes →	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
To provide the student with a conceptual understanding of the principles of engineering.		X				X			X		X					
To provide the student with practical laboratory experiences in order to facilitate conceptual understanding of engineering.												X				
Understand and practice engineering professionalism and teamwork, with a focus on applicable ethnic and gender issues.							X		X							

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) An ability to function on multi-disciplinary teams.
- e) An ability to identify, formulate, and solve engineering problems.
- f) An understanding of professional and ethical responsibility.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i) A recognition of the need for, and an ability to engage in life-long learning.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 1502: Principles of Engineering

uccs.edu



Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)
An ability to apply knowledge of mathematics, science, and engineering.	1. Apply design tools to basic scenarios 2. Ability to solve kinematics, statics, & dynamics problems	● EX, PR (Reverse Engr, Dynamics) ● O, PR (Ballistic Launcher)
An ability to identify, formulate, and solve engineering problems.	1. Simple Machines exercise 2. Glider Design Spreadsheets	● HW ● PR, CS
An understanding of professional and ethical responsibility.	1. Functioning effectively in teams 2. Ethnicity & gender applications for engineering	● O, P ● O, P, R (Career Paper)

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 1502: Principles of Engineering

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	<ol style="list-style-type: none"> Reverse Engineering Project Industry Panel 	●	PR, O
A knowledge of contemporary issues.	<ol style="list-style-type: none"> Class Discussions on Engineering Applications Career Investigations 	●	O
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	<ol style="list-style-type: none"> Instruction and application of basic spreadsheet use and calculations Analyze experimental data and draw conclusions Use basic A/D software 	●	CS, O
		●	PR
		●	PR (Glider Design)
		●	PR (Mousetrap car, Glider)
		●	PR (Marble Sorter)

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 1502: Principles of Engineering

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2009)	Action (Fall 2010)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.	●	●			
An ability to identify, formulate, and solve engineering problems.	●	●	Second year with new course content focusing on solving problems. Students still struggle at times, but considered normal for freshman level.	Will continue with a Learning Community with Calculus and ID 101 Imagine to assist in this area.	Learning Community students seem to develop study skills faster. Academic maturity and ability to solve problems above that of their peers.
An understanding of professional and ethical responsibility.	●	●			

MAE 1502: Principles of Engineering

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2009)	Action (Fall 2010)	Impact of Action
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.					
A knowledge of contemporary issues.					
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.					

MAE 1502: Principles of Engineering

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2010)	Action (Fall 2011)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.					
An ability to identify, formulate, and solve engineering problems.			Note: Continued with a Learning Community with Calculus and ID 101 Imagine to assist in this area.	Modified Learning Community with MAE 1503, one Freshman Seminar class (student choice) and Engl 1310.	
An understanding of professional and ethical responsibility.					

MAE 1502: Principles of Engineering

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2010)	Action (Fall 2011)	Impact of Action
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.					
A knowledge of contemporary issues.					
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.			Note: One Spring 2011 section is being developed as writing-intensive. Goal is to enhance student communication skills		

2010: MAE 2103 Engineering Mechanics I



UNIVERSITY OF COLORADO AT COLORADO SPRINGS

MAE 2103 Engineering Mechanics I

Course Assessment: February 22nd 2011
Course Lead Instructor: Steve Tragesser

Term: Fall 2010

		Overall Standing	
		Assessment	Performance
Before		●	●
Now		●	●

Department of Mechanical and Aerospace Engineering
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Catalog Description and Linkages

- "Force vectors, moments of force, equilibrium of a particle and rigid bodies, structural analysis and trusses, internal forces and shear, friction, center of gravity and mass, moments of inertia, virtual work, and kinematics of particles."

Prerequisites:

- ⊙ Math 135 Calculus I
- ⊙ PES 111 General Physics I
- ⊙ MAE 1503 Introduction to Engineering Design

Course Goals: By successfully completing this course, the student will be able to:

- Manipulate and solve problems using vectors
- Interpret common support reactions and draw appropriate free-body diagrams
- Combine forces and moments into equivalent systems
- Use the definition of equilibrium in 1, 2 and 3 dimensions for particles and rigid bodies
- Analyze internal tensions and compressions in members of structures (trusses and machines)
- Determine frictional forces and their effect on equilibrium and impending motion of rigid bodies
- Find centers of mass and moments of inertia for rigid bodies, cross-sectional areas, and composite bodies
- Determine position, velocity and acceleration for standard coordinate systems (cartesian, cylindrical, normal tangential)

Target Courses:

- ⊙ MAE 2104 Engineering Mechanics II

Level ⊙: Exposure; vocabulary; qualitative and quantitative understanding

Level ⊙: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems

Level ⊙: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems

MAE 2103: Eng Mech I

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Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓ Department Outcomes ⇒	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Manipulate and solve problems using vectors	X				X						X				
Interpret common support reactions and draw appropriate free-body diagrams	X				X						X				
Combine forces and moments into equivalent systems	X				X						X				
Use the definition of equilibrium in 1, 2 and 3 dimensions for particles and rigid bodies	X				X						X				
Analyze internal tensions and compressions in members of structures (trusses and machines)	X				X						X				
Determine frictional forces and their effect on equilibrium and impending motion of rigid bodies	X				X						X				
Find centers of mass and moments of inertia for rigid bodies, cross-sectional areas, and composite bodies	X				X						X				
Determine position, velocity and acceleration for standard coordinate systems (cartesian, cylindrical, normal tangential)	X				X						X	X			

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- c) An ability to design a system, component, or process to meet desired needs: with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) An ability to function on multidisciplinary teams.
- e) An ability to identify, formulate, and solve engineering problems.
- f) An understanding of professional and ethical responsibility.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i) A recognition of the need for, and an ability to engage in life-long learning.
- j) Knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 2103: EngMech I

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Assessment Process Mapping

Department Outcomes (Current Offering)	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)
An ability to apply knowledge of mathematics, science, and engineering	EX – Find support reactions for a beam with a 3-D load	●
An ability to identify, formulate, and solve engineering problems	HW – Find centroid of a car	●
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	EX – Method of joints for trusses	●
A knowledge of chemistry and calculus-based physics with depth in physics.	EX – Find position, velocity and acceleration at specific time given velocity expression	●

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 2103: EngMech I

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Assessment Process and Student Performance

Department Outcomes (Current Offering)	A	P	Problem (Fall 2009)	Action (Fall 2010)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering					
An ability to identify, formulate, and solve engineering problems					
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice					
A knowledge of chemistry and calculus-based physics with depth in physics.					

2010: MAE 3310 Heat and Mass Transfer



UNIVERSITY OF COLORADO AT COLORADO SPRINGS

MAE 3310 Heat and Mass Transfer

Course Assessment: February 22nd, 2011

Course Lead Instructor: Julie Albertson

Term: Fall 2010

Overall Standing		
	Assessment	Performance
Before		
Now		

Department of Mechanical and Aerospace Engineering
University of Colorado at Colorado Springs

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UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Catalog Description and Linkages

- "The principles of heat transfer: conduction, convection, and radiation; steady-state and transient conduction, thermal contact resistance, insulation, heat capacity; forced and natural convection, velocity and thermal boundary layers, fluid flow; radiation from blackbodies, surfaces and the sun."

Prerequisites:

- ③ Math 313 Linear Algebra
- ③ Math 340 Differential Equations
- ③ MAE 3130 Fluid Mechanics
- ② MAE 2301 Thermodynamics

Course Learning Objectives:

- ◆ By the completion of this course, students will be expected to be able to:
- ◆ Correctly identify the mode of heat transfer.
- ◆ Solve both steady and transient heat conduction equations.
- ◆ Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.
- ◆ Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.

Level ①: Exposure; vocabulary; qualitative and quantitative understanding

Level ②: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems

Level ③: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems

MAE 3310: Heat and Mass Transfer

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Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓	Department Outcomes ⇒														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Correctly identify the mode of heat transfer.	X				X										
Solve both steady and transient heat conduction equations.	X				X	X					X				
Differentiate between forced and free convection, correctly reduce and solve the boundary layer equations for simple geometries, and use dimensional analysis to determine the appropriate convection correlation.										X			X		
Determine the radiation characteristics of surfaces and calculate the net radiant exchange between those surfaces.	X				X							X			

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- e) An ability to identify, formulate, and solve engineering problems.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to apply knowledge of mathematics, science, and engineering.	<ol style="list-style-type: none"> Weekly homework Projects Quizzes - conceptual 	●	HW PR, R EX
An ability to identify, formulate, and solve engineering problems.	<ol style="list-style-type: none"> Weekly homework Exams 	●	HW EX
An ability to communicate effectively	<ol style="list-style-type: none"> Written communication – project reports 	●	PR, R
A knowledge of contemporary issues.	<ol style="list-style-type: none"> Handouts from Skunkworks Examples incorporated into lecture Solar energy systems lecture 	●	O O

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)	
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	1. Projects – Excel, MATLAB 2. HW - MATLAB	●	PR, R
A knowledge of chemistry and calculus-based physics with a depth in physics	1. Homework 2. Exams	●	HW EX
An ability to apply advanced mathematics	1. Homework 2. Project 3. Exams	●	HW PR, R EX
Familiarity with statistics and linear algebra	1. Projects (linear algebra)	●	PR

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets;
HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2009)	Action (Fall 2010)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.	●	●		Will continue Gateway Exam	
An ability to identify, formulate, and solve engineering problems.	●	●			
An ability to communicate effectively	●	●			
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	●	●			
A knowledge of contemporary issues.	●	●			

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2009)	Action (Fall 2010)	Impact of Action
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.					
A knowledge of chemistry and calculus-based physics with a depth in physics					
An ability to apply advanced mathematics					
Familiarity with statistics and linear algebra					
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems			Students still need work on actual engineering applications	More ill-defined, outside the box projects – added one additional project.	Some improvement in ability to define problem and solution process.

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2010)	Action (Fall 2011)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.					
An ability to identify, formulate, and solve engineering problems.					
An ability to communicate effectively					
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.					
A knowledge of contemporary issues.					

MAE 3310: Heat and Mass Transfer

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2010)	Action (Fall 2011)	Impact of Action
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.					
A knowledge of chemistry and calculus-based physics with a depth in physics					
An ability to apply advanced mathematics					
Familiarity with statistics and linear algebra					
An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems			Students still need work on actual engineering applications	Suggest more ill-defined, outside the box projects	

2010: MAE 4120 Machine Design II



UNIVERSITY OF COLORADO AT COLORADO SPRINGS

MAE 4120 Kinematics

Course Assessment: February 22 2011
Course Lead Instructor: Leal K. Lauderbaugh

Term: Fall 2010

Overall Standing		
	Assessment	Performance
Before		
Now		

Department of Mechanical and Aerospace Engineering
University of Colorado at Colorado Springs

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UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Catalog Description and Linkages

- Kinematic theory of planar mechanisms; position, velocity and acceleration analysis, coupler curves, centrodes, analysis and synthesis of 4 bar linkage, engine dynamics.

Prerequisites:

- ③ MAE 2102, MAE 3501
- ② MATH 313

Course Outcomes: By successfully completing this course, the student will be able to:

- ◆ Analyze and represent the position, velocity and acceleration of a mechanism with a vector model
- ◆ Design a four bar linkage
- ◆ Design a cam mechanism to produce motion in a one-degree-of-freedom follower
- ◆ Analyze the motion and power transmission through a gear train
- ◆ Analyze the mechanical components in single cylinder and multi cylinder engines
- Target Courses:

Level ③: Exposure; vocabulary; qualitative and quantitative understanding

Level ②: Ability to apply knowledge to qualitative and quantitative analysis over limited set of problems

Level ③: Ability to apply knowledge to qualitative and quantitative analysis over wide range of problems

MAE 4120: Kinematics

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Mapping Course Outcomes to Department Outcomes

Department Outcomes:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) An ability to function on multi-disciplinary teams.
- e) An ability to identify, formulate, and solve engineering problems.
- f) An understanding of professional and ethical responsibility.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i) A recognition of the need for, and an ability to engage in life-long learning.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of chemistry and calculus-based physics with depth in physics.
- m) An ability to apply advanced mathematics.
- n) Familiarity with statistics and linear algebra.
- o) An ability to work professionally in both thermal and mechanical systems including an ability to design and realize such systems.

MAE 4120: Kinematics

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Mapping Course Outcomes to Department Outcomes

Course Outcomes ↓ Department Outcomes ⇒	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Determine the type of motion of a four-bar mechanism from its geometry.	X				X										
Represent the position of a mechanism with a vector model.	X				X										
Perform the velocity, acceleration and dynamic force analysis of a planer mechanism.	X				X							X			
Design a four bar linkage.	X				X							X			
Design a cam mechanism to produce motion in a one-degree-of-freedom follower consistent with virtually any function.	X				X						X	X			
Analyze the motion and power transmission through a gear train.	X				X						X				
Analyze the mechanical components in single cylinder and multi cylinder engines.	X				X						X	X			

MAE 4120: Kinematics

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Assessment Process Mapping

Department Outcomes	Representative Criteria (primarily highlights & problem areas - not a complete list)	Student Performance (Assessment Type)
An ability to apply knowledge of mathematics, science, and engineering.	Write and evaluate vector loop equations for linkages Use Polynomial functions to specify cam profiles	● EX, PR
An ability to identify, formulate, and solve engineering problems.	Generate performance specifications for project systems then design mechanisms to meet those specifications	● PR
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Use of computer design packages to design linkages, engines and cams	● HW, PR
A knowledge of chemistry and calculus-based physics with depth in physics.	Apply Newton's laws to develop and solve models of dynamic forces in machine elements	● EX, HW, PR

EX = Graded Tests (Final, Exams, Quizzes); R = Rubrics; P = Peer Evaluations; CS = Project Cut Sheets; HW = Homework; PR = Graded Project or Lab Report; O = Faculty Observations; FG = Focus Groups

● = "good" ● = "okay" ● = "bad" ○ = "n/a"

MAE 4120: Kinematics

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Assessment Process and Student Performance

Department Outcomes	A	P	Problem (Fall 2007)	Action (Fall 2008)	Impact of Action
An ability to apply knowledge of mathematics, science, and engineering.	■	■			
An ability to identify, formulate, and solve engineering problems.	■	■			
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	■	■			
A knowledge of chemistry and calculus-based physics with depth in physics.	■	■			

MAE 4120: Kinematics

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Appendix H-4 Faculty Notes from Assessment Meetings

Course Review and Assessment Meeting

30 September 2008

Stevens, Gorder, Lauderbaugh, Ketsdever, Tragesser, Webb, Sooklal, Pingen, Albertson

1) Course Mapping and Lead Instructors

add machine design to “o”, Sooklal and Pingen to select courses to be lead instructor on

2) Course reviews

we need to do a better job of coordinating with honoraria on preparing course reviews; sometimes difficult; don't want to add too much to honoraria load

3) More quantitative evaluation

Julie is using scores on selected materials as more quantitative evaluation, representative of class as a whole? what about students who didn't do that assignment? better than anything else that we have, some more quantitative evaluation is improvement, even if imperfect, cannot get to perfect quantitative, ...

4) MAE 2101 Dynamics (going to 2104)

discussion of differential equations as co-requisite, suggestion that it isn't needed, discussion of use, needed for background, foundation, content of course, conclusion to keep it as it is

5) MAE 2301 Thermodynamics

improvement in the 2nd law section achieved, no further changes in the course content or pacing, introduction of some computer-based lecture material is next improvement

6) MAE 3130 Fluids

remove statistics/linear algebra from outcome mapping – used, but not extensively, covered adequately elsewhere, grading paradigm: students who skip hw but come to class; grading bias introduced in team projects, discussion of how to take that bias into account, some experiences of removing the bias through various grading schemes and weightings

7) MAE 3310 Heat and Mass Transfer

discussion and review of pre-requisite, AY07-08 changes will take care of most of the issues, discussion of outcome mappings for heat and mass transfer

Course Review and Assessment Meeting

24 February 2009

Stevens, Gorder, Lauderbaugh, Tragesser, Webb, Sooklal, Pingen, Albertson

1502 Albertson

formal pre-req. to 1503, use teamwork

discussion of target course, 1503

improvements in problem solving skills has been seen

moving toward including in a learning community: 1502, Calc, freshman seminar

2103 Tragesser

added kinematics of particles

in touch with honoraria as they begin teaching it

addressed shortcomings identified for 4402

3010 Webb

getting better

ready to be incorporated into other classes as per planned change

design of experiments will continue to be addressed

look at making 3005 a pre-req. to heat transfer

3302 Stevens

students doing very well

most shortcomings addressed

open-ended problems need work

discussion on open-ended problems—3302 is one of first classes for that

doing very well in senior classes with that

4120 Lauderbaugh

going very well

shortcomings have been addressed

3401 Gorder

some mapping issues to be cleaned up

very mature, stable class

shortcomings have been addressed

4402 Sooklal

3-D coordinate transformations need work

discussion of coordinate transformations and approaches

multiple transformations

adding more time for transformations

Course Review and Assessment Meeting
20 Oct 2009

Present: Albertson, Gorder, Tragesser, Ketsdever, Stevens, Sooklal, Webb

Albertson 1503

*students do hand drawing before inventor, neatness is really lacking

*intend to use examples from alumnus who shows why drawing line weights are important to design

Peter: do we want to impose hw structure uniformly throughout curriculum?

Steve: mixed feelings, pros and cons

Julie: easy to do in 1502/1503

Andrew: more applicable t lower division, 2103, 1502, 1503

Peter: just structure to lay it out, not specific

Julie: hw format used in heat transfer class

more discussion....

conclusion: Julie will introduce into 1502

*written communication lacking—continue to emphasize

Jim: same in Thermo II

English 209, coordination on communication issues

Tragesser 2104

*first assessment since 2101/2102 change

*no major problems with class

*equations of motion students were weak, emphasized again in 4402

*reminder that the 2101/02 change to 2103/04 was motivated by issues seen in 4402

Val: use 2103/04 review in 4402 to help remember main concepts

Albertson 2301

*considering making voice-over power points available to students
discussion...general agreement

Scully 2055-3055

*consider removing life-long learning & global societal context from course

discussion...definitely remove global societal context; leave in life-long learning—this is not a lesson but comes from the open problems used in the course

*lack in writing/oral presentations— will add assignments

*design-of-experiments: covered in 3005, so, can be added but doesn't need to be major focus

Sooklal 3005

*lacking in communication, errors in objectives, conclusions, need to show where conclusions come from

*exposed students to equipment before measurements labs

- *students need to pay attention; safety is emphasized
- *more structure and more practice instituted into class, standardized lab format will be developed, weekly discussion instituted

Albertson 3130

- *statics now required pre-requisite—very useful for teaching hydrostatics
- *ill-defined problems are still challenging for students
- *add more ill-defined problems, additional practice before exams

Sooklal 3501

- *incoming students (from St. of Materials) seem to be much, much stronger, definite improvement seen over previous
- *strength in calculus was a problem, review has helped, chain rule, singularities
- *need to start with review of materials – not getting macroscopic matls in Chem 301
- *more in-class discussion, more worked examples

Lauderbaugh 4421

- *class is going very well—has improved from past

Gorder 4510/4511

- *requiring test plan if test/build is not feasible; not a problem, just an improvement

23 Feb 2010

Assessment meeting for Fall 2009 Semester

Albertson, Gorder, Zama, Tragesser, Pinggen, Webb, Stevens, Sooklal, Lauderbaugh

1502 Albertson

- talk about professional responsibility and teamwork, issues of working on teams
- contemporary issues—adding more material
- this semester had a learning community where matched and Imagine class with a 1502 class and a calculus class
 - had 13 students, had same group in 2 classes, students connected very well, still working together well
 - Q: could class size be responsible? A: maybe, still looking at this
 - goal of learning community was to help w/ non-curricular issues surrounding retention
- will continue w/ learning community going forward
- have added homework to connect math/engineering more to projects

2103 Tragesser

- still some difficulties with 3D forces, and with 3D reaction forces and moments
- spent more time on reaction forces—this was successful
- will allocate more time to 3D forces
- students did better on free body diagram concepts

3302 Stevens

- design problem understanding was helped by giving example (worked in class—so fairly simple) of open ended problems; walked them through it—worked very well
- next problem will be psychrometric weaknesses—just needs more time devoted to it

3310 Albertson

- differential equations weak – tried pre-test, grade, give it back and give students a week to correct it—essentially a forced review
- poor ability to communicate technical information—spent time talking about how to do it and how to communicate calculations
- Ken: same problem in his classes—tries to review, but some students still weak
 - Julie: nursing developed on-line class, self-paced, optional of all review mat'l students should have had
 - Ken: we have no gate on basic math and basic communication skills
 - Becca: had to take engineering math before controls as undergraduate
 - Zama: review in class and out of class helpful, some students won't do it
 - Peter: my approach is, "here is what you should know" if you don't, then figure it out
 - Ken: wind up flunking some people just because they can't do the math...

- students need additional project experience
 - hot water heater example
 - students had to figure out ill-defined parts
 - different groups made different assumptions—examined differences in results
- will do other ill-defined projects in the future
- the more exposure that we can give to ill-defined projects, the better, within limits

Steve: maybe we could add this to some course descriptions....
Ken: could make lab set-ups from car parts, water heaters, etc. to be available...

3311 Zama

- assessment was good, performance was OK
 - most trouble was in hooking up experiments even though it was required to demonstrate knowledge of it in pre-lab
- ability to design experiments and identify equations is weak
 - Julie: students very good at learning to use equipment, apply statistics
- more time in lecture to experiment design, put grade value on pre-lab planning
- have students identify equations, still needs work, more one-on-one help

3401 Gorder

- course is going well
- overall, most students get math, eventually
- no problems w/ course

4120 Lauderbaugh

- course is going very well
- no problems other than those already discussed

4402 Sooklal

- trouble with 3D analysis at beginning, but by the end, they can do it
- looking at end product, so OK if they get it by end
- still have trouble w/ 3D transformations, but overall seems OK
- students need more practice with other-than-Cartesian transformation matrices
 - more interactive discussion and examples in class
 - set up demos, looking for model demo kit

Course Review and Assessment Meeting for Spring 2010 semester

28 September 2010

Present: Albertson, Gorder, Webb, Sooklal, Tragesser, Calvisi, Lauderbaugh, Stevens, Zama

1503–Albertson

- *disconnected 1502 & 1503 from prerequisite sequence–went back and removed everything in 1503 that depended on 1502
 - flexibility for transfer students
- *Trying to improve the level of professionalism, largely a maturity issue, but there is room to start trying to help them understand professionalism
- *Visual communication – handwriting, drawing
 - instituted chart showing good and bad examples of each
 - showed real-world examples of consequences of poor communications, failures, part manufacturing gone wrong, etc.
 - some improvement, still lacking
- *more time connecting writing to engineering
- *participating in writing-across-the-curriculum campus program
- *found a design text with really good examples
- *requiring students to re-do drawings until they get it right
 - Lauderbaugh: must have it in syllabus, requiring students to pass the class based on individual scores–found that is OK if in syllabus

2104–Tragesser

- *everything is going very well
- *coordinated with Val about performance in 4402, things improving

2301–Stevens

- *continuing to work on problem solving
 - students tend to be weak on less well-defined problems
 - presented problem solving rubric, helps some students, general improvement, not great
- *improve lectures for student attention

3302–Albertson

- *Webb: should make dynamics a pre-requisite for fluids,
 - discussion: should fit w/in schedule, statics already a pre-req., would help with fluids
- ➡. ADD 2104 AS PRE-REQUISITE FOR FLUIDS
- *issues with understanding problem setup
 - additional exercises
 - more practice is mostly what is needed
- *using writing-across-the-curriculum to make fluids more writing intensive
 - Webb is introducing writing also

3501–Sooklal

- *review beam theory, stress analysis, application to fasteners, shafts, bearings
- *emphasis on setting up problems
- *some review of strength of materials
- *issues with analysis of basic structural problems
 - increased number of worked examples to completion
 - telling them, “make sure you can close text and work problem”
- *Albertson: addressing (1502) the mismatch between following a problem and working a problem
- *Gorder: students are very very good in sr. design at taking an ill-defined problem and providing definition and a solution

4421–Gorder

- *all going very well, no problems to report

4510/11–Gorder

- *noticed that customer interaction had taken a negative turn, students didn’t contact customers
 - normally assume interaction with customer is OK, usually problem isn’t at the student end but the customer end
 - weren’t communicating schedules
 - will add an additional design review to the schedule in the future
- *2 semester sequence so must be taken in final full AY–not having problems any more with students NOT taking it in time, but starting to have some students wanting to get it early–we want them to have it as late as possible in their ug curriculum. discussion: automatic block based on credit hours, won’t work, using a class as a pre-requisite won’t work, can handle it on a case-by-case basis, pay particular attention during registration advising
- *English 2090 as pre-requisite for sr design–would be better for fluids
 - needs to be writing intensive
 - fluids will qualify for that
 - using ASME technical paper as guide
 - better for the students to see and use several different style guides in ug career
 - 2090 does use some style guide, not sure which...MLA?
- ➡. ADD English 2090 AS PRE-REQUISITE FOR FLUIDS

3131–Zama

- *co-requisite with class will start being enforced now that we are nearing end of transition
- *at jr level–should be able to complete the lab even if it doesn’t line up w/ lecture completely
- *trouble applying theory
 - better pre-labs and lab reports
- *ability to design experiments emphasized in pre-lab, sometimes overview, sometimes actual design.

Course Review and Assessment Meeting for Fall 2010 semester

22 February 2011

Present: Albertson, Gorder, Webb, Sooklal, Tragesser, Calvisi, Lauderbaugh, Stevens, Zama, Miller

MAE 1502: Julie Albertson

- *doing a learning community in the fall again
- *last one was math-1502-imagine, this one will be 1502-1503-english, since 1502 & 1503 are no longer coupled
- *all going well in 1502 sections: coordination and teaching are going fine

MAE 2200: Jesse McClure (Julie presenting slides)

- *need to review outcomes map for this course–Julie
- *discussion of pre-requisite structure–should this be before St. of Matls?
 - done both ways: micro first, then macro, or other way around–micro first is more common
 - currently matches well with 3005 topics
 - calculation very specific to axial stress/strain, i.e., not a problem in the class if they don't have a good understanding of out-of-plane stresses...
 - intermediary heat treatment is important
 - fits well with current St. of Matls.
 - we'll leave it where it is
- *Jesse requested more test equipment for lab: impact tester, torsion test
 - referred to laboratory committee

MAE 2103: Steve Tragesser

- *everything going very well–no changes or problems

MAE 2055-3055: Kyle Webb (Julie presenting slides)

- *integrated book into 2055 this semester–Scully and Porter will follow in future
- *Val met with Kyle, Fred and Tim last semester to coordinate on the classes-very productive meeting, decided on equipment, supplies, talked about standardizing on book
- *discussion on making 1502 a pre-requisite for 2055–most would have already had it because it is pre-req for 2103–decided on no change

MAE 3005: Valmiki Sooklal

- *students divided between those who are motivated to learn and those who are not–required passing quizzes as well as labs–that has helped a lot with motivation
- *students are developing ability to write better reports as the semester progresses–Val shows examples in class (no names) of good and bad examples of work and discusses what is needed for a good lab report

*introduced some labs that require no lab report in order to ease overall burden—that is working well, also

MAE 3302: Lianna Miller

*everything going very well

*gives opportunity to revise for credit on exams—that helps students learn material

*improving decisions on ideal equations vs. real effects

*students are coming to grips with having ambiguous problems—still want a definitive answer, but improving

MAE 3310: Julie Albertson

*communications (written, oral) continue to be an ongoing struggle—seeing some improvement

*giving gateway math exam—graded only on re-worked exam—gives students a focus on the math that they need for the class

MAE 3311: Zama Alemar

*change for the better—including design of experiments in class

*now that we are almost through the transition period, nearly all students are taking the class in proper sequence which helps, too

*giving more lecture before lab

MAE 3401: Peter Gorder

*all going very well, no changes needed

MAE 4120: Ken Lauderbaugh

*no changes or problems

MAE 4402: Valmiki Sooklal

*worked more examples before getting to harder parts of course

*adding videos, more model examples to help visualize 3-D problems

*just a difficult course—students always struggle

MAE 3201: Michael Calvisi

*students have trouble with recognizing statically indeterminate problems

*limitations of linear elastic representations

*need improvement in differential calculus—do simple derivatives and integrations

*didn't cover brittle failure last semester—no time

*did cover stress transformations, but not strain transformations

GENERAL

*Discussion of adding a mechanism to forward assessment and review slides to next instructor if instructors change in a course

-this issue is partly covered by this meeting—chance to discuss and exchange information

-conclusion: Julie will forward all slides each semester—that way she won't have to filter out whether the instructor has changed

Signature Attesting to Compliance

By signing below, I attest to the following:

That _____ (*Name of the program(s)*) has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET's *Criteria for Accrediting Engineering Programs* to include the General Criteria and any applicable Program Criteria, and the *ABET Accreditation Policy and Procedure Manual*.

Dean's Name (As indicated on the RFE)

Signature

Date