THE OHIO STATE UNIVERSITY

College of Engineering

122 Hitchcock Hall
2070 Neil Avenue
Columbus, OH 43210-1278

Phone 614-292-2651
FAX 614-292-9379
E-mail engosu@osu.edu

Date: 29 June 2010

To: Randy Smith
Vice Provost, Office of Academic Affairs

From: Ed McCaul
Secretary College of Engineering Committee on Academy Affairs (CCAA)

Subject: Semester Conversion Proposals for BS in Mechanical Engineering

Attached is a letter from K. (Cheena) Srinivasan, Department Chair of Mechanical Engineering, as well as a semester conversion proposal for the BS in Mechanical Engineering Degree.

This proposal was reviewed by a subcommittee of CCAA. After reviewing the proposal and having some changes made to it the subcommittee recommended to the full committee that it be approved. After a discussion, CCAA unanimously approved the proposal on the 29th of June 2010 and requested that I forward the proposal to you for consideration by CAA. If you have any questions concerning this proposal please let me know.

Department of Mechanical Engineering

Peter L. and Clara M. Scott Laboratory
201 West 19th Avenue Suite N350
Columbus, OH 43210-1142

Phone (614) 292-2289
Fax (614) 292-3163
E-mail Meadmin@mecheng.osu.edu
www.mecheng.ohio-state.edu

To: The Office of Academic Affairs

From: K. (Cheena) Srinivasan, Chairperson, Department of Mechanical Engineering

Date: May 18, 2010

Re: Semester Program Proposal for ***The Department of Mechanical Engineering***

The proposed curricula for the degrees offered by the Department have been developed following extensive consultation with our alumni and current students, our departmental external advisory board, and discussions among faculty members. Particular effort has been spent on the BSME program. In addition to the feedback that we get from senior exit surveys that have been required of all of our BSME graduates over the last ten years, we surveyed 300 selected alumni from the last 20 years and discussed the curriculum at an all-day meeting held on campus, July 31, 2009. The meeting was attended by 40 alumni, 15 faculty members, and some members of the department's external advisory board. Speakers from the faculty at Olin College, the University of Texas at Austin, and Massachusetts Institute of Technology described curriculum-related changes at their institutions to our faculty members as they discussed the proposed curriculum. Faculty members leading the curriculum effort also participated in national forums dedicated to discussions of trends and drivers of change in mechanical engineering education. The proposed curriculum was fashioned in response to the feedback and inputs obtained through these venues. Our proposed BSME curriculum has also been benchmarked against program curricula from peer institutions such as the University of Michigan, Purdue University, Georgia Institute of Technology, and MIT. We are confident that our proposed curriculum is responsive to the needs of our stakeholders, as well as to emerging trends and drivers of change in engineering education in general. We feel it will position our program at the leading edge of mechanical engineering undergraduate education.

All components of the proposed programs were discussed at a number of faculty meetings in the fall, winter, and spring quarters, and the Faculty Interest Groups worked internally to form the new curricula. All the committees charged with coordinating the semester conversions included student representatives. In addition, the proposed programs were discussed with current undergraduate and graduate students at open meetings. The faculty vote on the BSME curriculum, by secret paper ballot, was 36 in favor, one against, and one abstained (51 faculty were eligible to vote). The faculty vote on the ME graduate degree programs was unanimously in favor with 37 voting. The Nuclear Engineering undergraduate minor and graduate programs were unanimously approved by the program faculty.

I am therefore enthusiastically recommending approval of the enclosed proposals for the following programs

- BS in Mechanical Engineering
- MS in Mechanical Engineering
- PhD in Mechanical Engineering
- Nuclear Engineering Undergraduate Minor
- MS in Nuclear Engineering
- PhD in Nuclear Engineering

I am also recommending that the following programs be withdrawn, based on faculty discussions:

- Mechanical Engineer (Advanced Professional Program)
- MS in Engineering Mechanics
- PhD in Engineering Mechanics
- Graduate Minor in Radiation Safety

BS in Mechanical Engineering (BSME) Program Proposal

1. Name of Program
Mechanical Engineering

2. Name of Degree
Bachelor of Science in Mechanical Engineering

3. Responsible Academic Unit
Department of Mechanical Engineering

4. Type of Program
a. Undergraduate Bachelors Degree Program

5. Semester Conversion Designation
a. Re-envisioned with significant changes to curricular requirements, but no changes to program goals, outcomes or objectives.

6. Program Learning Goals
In delineating our educational goals, we have traditionally distinguished between "objectives" and "outcomes." Objectives tend to describe the future attributes of our successful graduates and their careers. Outcomes, on the other hand, are the direct educational outcomes of the courses which make up the curriculum. The first eleven outcomes (a-k) are common to all engineering programs, as stated by our accreditation board, ABET, and the final four (l-o) are specific to Mechanical Engineering.

The program educational objectives are to educate graduates who will be ethical, productive, and contributing members of society. As they progress professionally after graduation, our alumni will:
I. Use their engineering foundation for success in

- Technical careers in industry, academia, government, or other organizations
- Graduate school in engineering
- Nontechnical careers in areas such as law, medicine, business, public policy, secondary education, service industries, etc.
- Careers involving engineering practice, research and development, or engineering education, management, or service
- Careers involving management or entrepreneurship

II. Use lifelong learning skills to

- Take advantage of professional development opportunities in their disciplines
- Develop new knowledge and skills and pursue new areas of expertise or careers
- Adapt to changing global markets and workforce trends

III. Engage in professional service by

- Using their engineering background to advance society and to help solve technical and societal problems
- Developing new knowledge and products that will promote sustainable economic development to improve the quality of life
- Promoting the practice of engineering as a source of societal good

The program educational outcomes: Our program will give our graduating seniors the skills and knowledge base to allow them to achieve our program objectives after graduation. By the time of graduation, our students will have:

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

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

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

d) an ability to function on 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) the ability to apply principles of engineering, basic science, and mathematics to model and analyze components or processes

m) the ability to apply principles of engineering, basic science, and mathematics to design and realize physical systems, components, or processes

n) an ability to work professionally in the thermal systems areas

o) an ability to work professionally in the mechanical systems areas

7. Proposed Mechanical Engineering Program Requirements

General Education	**Course Number**	**Cr-Hrs**
Writing Level 1		3
Writing Level 2		3
Literature		3
Arts		3
Historical Study		3
Social Science 1		3
Social Science 2		3
Culture and Ideas: Ethics		3
Total Non-Double Counted General Education Hours		24
Engineering Core (Required of All Engineering Programs)		
Engineering Survey	ENG 1100	1
Introduction to Engineering - I	ENG 1181	2
Introduction to Engineering - II	ENG 1182	2
Engineering Calculus - I (Gen Ed Double Count - Math)	Math 1151	5
Engineering Calculus - II	Math 1152	5
Physics I (Gen Ed Double Count - Science)	Physics 1131	5

Total Engineering Core Hours		20
Required for the BSME Program		
Additional non-Dept of ME Requirements		
Engineering Math III (Linear Algebra)	Math 2???	3
Engineering Math IV (Calculus, Ord & Partial Diff Eqns)	Math 2???	3
Physics 2 (Gen Ed Double Count - Science)	Physics 1132	5
Chemistry for Engineers	Chem 1???	4
Choice of Biology, Additional Chemistry or Materials Science	1 course	4
Statistical Methods for Engineers (Gen Ed Double Count - Data Analysis)	Stat 4252	2
Engineering Economics	ISE 3040	2
Circuits	ECE 3???	3
Manufacturing Process Engineering	ISE 4500	3
Total Additional non-Dept of ME Required Hours		29
Mechanical Engineering Core		
Statics	ME 2010	2
Mechanics of Materials	ME 2020	3
Dynamics	ME 2030	3
Numerical Methods in Mechanical Engineering	ME 2850	3
Thermodynamics	ME 3501	3
Fluid Dynamics	ME 3503	3
Heat Transfer	ME 4510	3
Design and Analysis of Machine Elements - I	ME 3670	4
Design and Analysis of Machine Elements - II	ME 3671	3
System Dynamics and Vibration	ME 3360	3
System Integration and Control	ME 4360	3
Mechanical Engineering Laboratory		
Measurements and Data Analysis in Mechanical Engineering	ME 3870	3
Mechanical Engineering Capstone Laboratory	ME 4870	2
Mechanical Engineering Design		
Introduction to Mechanical Design	ME 2900	3
Mechanical Engineering Capstone Design - 1 (7 Weeks)	ME 4900	1.5
Mechanical Engineering Capstone Design - II (7 Weeks)	ME 490X.01	1
Mechanical Engineering Capstone Design - III	ME 490X.02	2.5
Senior Exit Survey	ME 4578	0
Total required hours offered by Dept of ME		46
Total required hours in BSME Program		75
Technical Electives		
Technical Elective		
Technical Elective		
Technical Elective		
Technical Elective		
Total Technical Elective Hours (Nominally 9 hours in courses offered by Dept. of ME and 3 hours outside)		12
TOTAL HOURS (BSME + Tech Elec + Engng Core + Gen Ed)		131

ME COURSE CONVERSIONS

Quarters	Semesters
410	2010
420	2020
430	2030
250	2850
	2900 (completely new course)
Parts of 501 and 502	3501
Parts of 503 and 504	3503
510	4510
Parts of 553, 561, 562, 563	3670
Parts of 553, 561, 562, 563	3671
481, part of 482	3360
Parts of 482, 570 and 571	4360
Parts of 570 and labs that are in 482, 512 and 561	3870
Parts of 581 and labs that are in 482, 512 and 561	4870
There are several paths through the Capstone 1. 564 and 581 2. 565.01, 565.02, 565.03 3. ENG 658, ENG 659.01, 659.02 See below and Section10. for more info	4900, 490X.01, 490X.02
578	4578

Details on Changes in the Capstone Design Experience

Old Path 1:

564 is a design process, project management and ethics course with a single design project that goes all the way to but short of building a prototype and testing it in the lab.

581 is a lab course that sometimes is tied to the project in 564, but not always and not always devoted to design per se. It is being turned into it's own capstone lab, 4870, independent of the new capstone requirement (4900, 490X.01, 490X.02). This will free the course up to stand on its own as an open-ended challenge type course fitting of the senior year, with a sequence of labs designed to promote independent thinking and problem solving.

Old Path 2:

565.01, 02, 03 is a 3 quarter sequence which is progress graded until the fnal grade in 565.03. The first quarter teaches the design process, project management, ethics and has a couple of little warm-up projects. The 2nd and 3rd quarters are spent on the main capstone project taken all the way through prototyping and testing. The projects are all related to biomedical assistive devices.

Old Path 3:

ENG 658, 659.01,.02. Path 2 is derived from this path which was developed by ME and then turned over to the College for budgetary and work load reasons. The structure is the same as above in Path 2, except every project is a real industrially sponsored project and there are students from several different engineering majors involved. Companies pay a nominal fee and the students work with the company representative throughout the project.

New Path:

4900, 490X.01, 490X.02. The details are in Section 8b. This sequence is patterned after Old Paths 2 and 3 and subsumes them. The various versions, X=1,2,..5 distinguish between the project types and Old Path 2's project type is X=5 and Old Path 3's project type is X=4. We have experience in the other project types through different projects run in the past through 564.

Most of these changes can also seen graphically by comparing the old and new curriculum maps: Figures 1 and 2 in Section 13.

8.a Current Mechanical Engineering Advising Sheet

New to OSU: _____ ME: _____

Mechanical Engineering www.mecheng.ohio-state.edu
2007-2008

Name_____ Email: _____@osu.edu

YEAR	AUTUMN	WINTER	SPRING
1	Math 151* (Calc & Analyc Geom)... 5____ Chem 121 (Gen Chem) ..... 5____ Engr 181 (Intro to Engr I) ..... 3____ Engr 100.12 (Engr Survey)..... 1____	Math 152 (Calc & Analyc Geom) .... 5____ Chem 125 (Chem for Engr) ..... 4____ Physics 131 (Partcls & Motion) ..... 5____	Math 153 (Calc & Analyc Geom) .... 5____ Engr 183 (Intro to Engr II)..... 3____ Physics 132 (Electrcty & Magntsm) 5____
2	Math 254 (Calc & Analyc Geom) .... 5____ Physics 133 (Elctrdynmc & Quant). 5____ ME 410 (Statics) ..... 4____	Math 415 (Ord Part Dff Equat) ..... 4____ ME 430 (Dynamics)..... 4____ MSE 205 (Intro to MSE) ..... 3____	ME 250 (Num Mthds & Anlys ME).... 4____ ME 420 (Intro Strength Materials) .... 4____ ME 501 (Thermodynamics) ..... 4____ ECE 300 (Electrical Circuits) ..... 3____
3	ME 481 (Sys Dynamics & Vibs) ..... 3____ ME 502 (Thermodynamics II)..... 3____ ME 503 (Fluid Dynamics I)..... 3____ ISE 311 (Manufacturing Engr)..... 3____	ME 504 (Fluid Dynamics II) ..... 3____ ME 561 (Fail Mds, Stres Anlys, Fail Prev)5____ ECE 320 (Elec Devices & Controls) . 3____ ISE 504 (Engr Econ Anlys)..... 3____	ME 482 (Sys Dynms & Electromech) 4____ ME 510 (Heat Transfer) ..... 3____ ME 553 (Knmtcs Dymn of Machinery) 4____ ME 562 (Dsgn Selct Mach Elem I).... 3____
4	ME 563 (Dsgn Selct Mach Elem II)... 3____ ME 570 (ME Measurements) ..... 5____ T.E……..3____ T.E……..3____	ME 571 (Prin of Automatic Control) .. 4____ ME 564 (Sr Dsgn Group Project) .... 4____ ~~ME 512 (Fluid Mech & Heat Trans Lab)~~2____** T.E……..3____	ME 581 (ME Lab) ..... 4____ ME 578 (Sr Program Review)..... 0____ T.E……..3____ T.E……..3____

GENERAL EDUCATION (35 hours)

TECHNICAL ELECTIVES (~~15~~ 17 hrs)**

English & Communication Skills (10)
A. _____English 110_____ (5) ___
B. Second Writing Course
_____367. ___ (5)____

Social Science (5 – 10)
_____ ( ) ___
_____ ( ) ___

Historical Study (5 – 10)
_____ ( ) ___
_____ ( ) ___

Arts & Humanities (5 – 10)
_____ ( ) ___
_____ ( ) ___
TOTAL = 25 hrs.

NOTE: Foreign language is not required for engineering students. However, if you are interested in foreign language courses, please see the back of this sheet or speak to your advisor to learn how these courses can fulfill some of your GEC requirements.

Ethics
(Your ethics course will also count for either a Social Science course or an Arts & Humanities course, depending on the ethics course that you choose.)
_____ (5) ____
Check one: This also counts as a
☐ Social Science (Ethics Group 1).
☐ Arts & Humanities (Ethics Group 2).

Diversity Experience
(Your diversity course will also count for either a second writing course, a Social Science course, or an Arts & Humanities course, depending on the diversity course that you choose.)
_____ (5) ____
Check one: This also counts as a
☐ Second Writing Course.
☐ Social Science.
☐ Arts & Humanities.

Concentration:
(Check one or more.)
☐ Applied Mechanics
☐ Automotive Engineering
☐ Biomechanical Systems
☐ Design & Manufacturing
☐ Dynamics, Vibrations, & Controls
☐ Energy Systems
☐ Nuclear Engineering
☐ Research / Advanced Studies

_____( )____
_____( )____
_____( )____
_____( )____
_____( )____
_____( )____

ME Required Coursework	~~142~~ 140
General Education Curriculum	35
Technical Electives	~~15~~ 17
Total Credit Hours(mnus survey)	192

** The technical elective program rules and course choices can be found on the Mechanical Engineering web page and also in the ME Undergraduate Student Handbook. Due to the temporary cancellation of ME 512, students are required to take 2 additional credit hours from the approved ME Technical Elective list.

Formal application to the major is required. Pre-requisite courses to the major are English 110 and the SPHR courses listed below. In order to be eligible to apply to the major students must have a minimum 2.00 CPHR and SPHR; however, these minimums do not guarantee acceptance to the major. *Acceptance into the Mechanical Engineering major is limited to 200 students per year and is competitive based on a student's SPHR.* Email meadvisor@osu.edu for more information. SPHR = CUMULATIVE GPA in Chem 121, 125; Physics 131 and 132; Engineering 181 and 183; Math 151-153 and 254; ME 410, or their equivalents.

8.b.Proposed BSME Advising Sheet - Pg 1.

First Year

Fall Semester			Spring Semester		
Math 1151	Engineering Calculus I	5	Math 1152	Engineering Calculus II	5
Chem 1XXX	Chemistry for Engineers	4	Physics 1131	Physics 1	5
ENG 1181	Intro to Engineering 1	2	ENG 1182	Intro to Engineering 2	2
ENG 1100	Engineering Survey	1	Science: Biology or Materials (3) or Chemistry		4
Gen Ed	Writing Level 1	3	Gen Ed	Literature	3
	Total	15		Total	19

Second Year

Fall Semester			Spring Semester		
Math 2XXX	Engineering Math III	3	Math 2XXX	Engineering Math IV	3
Stat 4252	Statistical Methods for Engineers	2	ME 2020	Mechanics of Materials	3
ISE 3040	Engineering Economics	2	ME 2030	Dynamics	3
ME 2010	Statics	2	ME 2900	Intro to ME Design	3
Physics 1132	Physics 2	5	ME 2850	Numerical Methods in ME	3
Gen Ed	Writing Level 2	3			
	Total	17		Total	15

Third Year

Fall Semester			Spring Semester		
ME 3360	System Dynamics and Vibrations	3	ME 3503	Fluid Dynamics	3
ME 3501	Thermodynamics	3	ME 3671	Design Anal. Of Mach Elements II	3
ME 3670	Design Anal. Of Mach Elements I	4	ME 3870	Msmnts and Data Analysis in ME	3
ECE 3XXX	Circuits	3	ME 4360	System Integration and Control	3
Gen Ed	Social Science 1	3	Gen Ed	Historical Study	3
	Total	16		Total	15

Fourth Year

Fall Semester			Spring Semester		
ME 4510	Heat Transfer	3	ME 490X.02	ME Capstone Design III	2.5
ME 4900	ME Capstone Design I (Week I-7)	1.5	ME 4870 -	ME Capstone Laboratory	2
ME 490X.01	ME Capstone Design II (Week 8-14)	1	ISE 4500	Manufacturing Proc Engng	3
Technical Elective		3	Technical Elective		3
Technical Elective		3	Technical Elective		3
Gen Ed	Social Science 2	3	ME 4578 - Senior Exit Survey		0
Gen Ed	Arts	3	Gen Ed	Culture and Ideas: Ethics	3
	Total	17.5		Total	16.5

8.b.Proposed BSME Advising Sheet - Pg 2.

Capstone Courses II and III: Choose from:

4901.01, 4901.02: General Projects
4902.01, 4902.02: Humanitarian Projects
4903.01, 4903.02: Projects Based on Design Team Competitions (SAE, CAR, Solar Decathlon, etc…)
4904.01, 4904.02: Industrially Sponsored Projects
4905.01, 4905.02: Bioengineering Projects

Technical Electives

1. Minimum of 12 cr-hrs total
2. Minimum of 6 cr-hrs of ME *Technical Electives* from approved list by Concentration Area, of which at least 2 courses must be from a single Concentration Area.
3. Minimum of 2 cr-hrs of ME *Design Elective* from approved list by Concentration Area.
4. Minimum of 2 cr-hrs of ME *Computational Elective* from approved list by Concentration Area.
5. Minimum of 2 cr-hrs of *Application Elective* chosen from approved list (includes some ME courses)
6. Two hours of *Professional Skills Elective* from approved list

Concentration Areas:
1. Applied Mechanics
2. Design and Manufacturing
3. Dynamic Systems
4. Energy, Fluid and Thermal Systems

Sample Application Areas:
1. Biomechanical Systems
2. Automotive Engineering
3. Nuclear Engineering
4. Advanced Transportation
5. Manufacturing

Note that Rule 2 is not in addition to the rest of the requirments. E.G. requirements could be met by:

1 3 cr-hr ME Design Elective in Conc. Area 1 - Satisifies 3 cr hr of Rule 1, 3 cr-hrs of Rule 2, and Rule 3
1 3 cr-hr ME Computational Elective in Conc. Area 1 - Satisifies 3 cr hr of Rule 1, rest of Rule 2 and Rule 4
1 3 cr-hr ME Applications Elective in any Conc. Area - Satisfies 3 cr hr of Rule 1 and Rule 5
1 3 cr-hr Professional Skills Elective - Satisfies 3 cr hr of Rule 1 and Rule 6

This example is just four courses, but to make more flexibility and allow for more courses within the 12 cr hr requirement 2 cr hr courses should be developed.

Please see the Department Website **www.mecheng.ohio-state.edu** for the current approved lists of all of the above categories of technical electives.

Note to Reviewers:

1. These lists have not been prepared or posted yet.
2. A number of new courses must come out of the concentration groups which have either a strong design or computational component. We are working on these courses now.
3. The use of 2 cr-hr increments in the requirements is there primarily to allow for 2 cr-hr courses as they get developed. We would like to develop 2 cr-hr courses for added flexibilty and potential for more breadth.
4. We plan to develop 2 cr-hr short term courses in the Professional Skills area. There are also several possible College of Engineering courses we could use and work with. We are thinking of 7 weeks in a regular semester or using the Maymester. We also will bring in practicing professionals for all or part of these new courses.

8.c Comparison Summary

Superscripts refer to the Notes below.

Curriculum Category	Current Curriculum in Semester Cr-Hrs (# of courses)	Proposed Curriculum in Semester Credit Hours (# of courses)
Eng. Survey (ENG 100)	0.7	1
Intro to Eng (Freshman)	4 (2)	4 (2)
Math (Calculus and Diff Eqns)	16 (5)	16[2] (4)
Physics	10 (3)	10 (2)
Chemistry	6 (2)	4 (1)
Additional Science: Biology or Chemistry, or Materials	2[1] (1)	4 (1)
Linear Algebra	0.7[2] (0)	0[2] (0)
Statistics	0.3[3] (0)	2[3] (1)
Circuits	4 (2)	3 (1)
Manufacturing	2 (1)	3 (1)
Engineering Economics	2 (1)	2 (1)
Mechanical Engineering Core		
Numerical Methods/Prog	2 (1)	3 (1)
Mechanics (Statics/Strength/Dynamics)	8 (3)	8 (3)
Thermodynamics/Fluid Mechanics/Heat Transfer	10.7 (5)	9 (3)
Stress Analysis/Failure Theories/Machine Design/Mechanisms	10 (3)	7 (2)
Systems/Controls/Measurements	7.3 (3)	6 (2)
Mechanical Engineering Laboratory	3 (1)[4]	5 (2)
Intro to Mechanical Design (Proj Mgt/Technical Comm/Ethics)	0	3 (1)
Capstone Design (Proj Mgt/Technical Comm/Ethics)	5.3 (2)	5 (3)
Technical Electives	11.3 (5)	12 (4)
General Education Curriculum	23.3 (7)	24 (8)
Total	128.7	131

Notes:

1. Materials is required now, but it will be one choice of three in an additional science category
2. The hours listed for Linear algebra currently are part of our Numberical Methods course (ME 250) which is 4 Qtr cr hrs (2.7 Sem cr hrs). The total then currently for Linear Algebra and Numerical Methods lines is 2.7 Sem cr hrs. We are proposing to add Linear Algebra to the sequence of courses taken from Mathematics.
3. In a similar way as above we have pulled out the Statistics currently taught in the Laboratory course (ME 570). The total of those two lines is 3.3 Sem cr hrs, which is the semesster equivalent of what the Laboratory course is currently. We are proposing to take a standalone course from Statistics
4. There are Labs in other courses, but the hours from those have not been pulled out from their hour count as was done above for Linear Algebra and Statistics..

9. BSME Curriculum Map

Course Number	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
ENGINEER 1181.03	*		*	**	***		*	**	*			*			
ENGINEER 1182.01	**		*	**	***		*				**	**			
ISE 3040	*							***	*		*				
MECHENG 2010	***		*		***		*				*	***	*		***
MECHENG 2020	***		*		***						*	***			***
MECHENG 2030	***				***		*		**		*	***			***
MECHENG 2850	***	**	*		***			*	**		***	***	***	**	**
MECHENG 2900	***	*	***		***	*	***	*	*	**	***	*	***	**	***
MECHENG 3360	***		*		**	*		*	*	*	**	***	**	*	***
MECHENG 3501	***							***	***		***	***		***	
MECHENG 3503	**				***			*	*		***	***		***	
MECHENG 3670	***	***			***		**				***	***	***		***
MECHENG 3671	***				***		**				**	***			***
MECHENG 3870	**	***	***	**	*	*	**	*	*	*	**	**	**	**	**
MECHENG 4360	***		**	*	*		*		*		***	***	**	*	*
ISE 4500	***	*			**				*		**	***			**
MECHENG 4510	**	*	*	*	*	*	*			*	*	**	*	**	
MECHENG 4870	***	***	**	***	***	*	**	**	**	*	***	***	***	***	***
MECHENG 4900	***		***		***	**	***	**	**	*	**	**	***	***	***
MECHENG 4901	***	*	***	***	**	**	***	*	*	*	***	***	***	**	**

The columns are the Educational Outcomes (a-o) listed on page 3 of this proposal. Only one of the Capstone II and III paths is shown (4901), since they are all the same. In each column the level of treatment steadily increases from beginning to intermediate to advanced. The number of asterisks indicates the amount of coverage related to the particular objective.

* 1-2 hours
** 3-6 hours
*** 7+ hours

10. Rationale for Proposed Changes to the BSME Curriculum

The curriculum re-design process has been many years in the making and has been based on significant feedback that we have obtained over the years from our graduating seniors through online surveys and required exit interviews, and from our alumni through the annual College of Engineering alumni survey. In addition, we held a Retreat this past summer with 45 alumni (ranging in time out from 1 year to 30 years) and members of our External Advisory Board. The Retreat was preceded by a directed survey about the conversion, and during the Retreat we collected detailed suggestions about various aspects of the new curriculum design. We also carried out research and wrote two proposals to NSF for curriculum wide reform in the early 2000s, but due to lack of funding, have not implemented any of the ideas from that effort, but plan to do so in the proposed curriculum. That effort was motivated both by the national trends in the discipline, as well as constituent feedback. We have also incorporated some of the suggestions from our last ABET accreditation review in 2005. All increases or decreases in emphasis or coverage compared to the existing curriculum can be directly related to the feedback we have obtained. A number of the initiatives have been made possible by the overall reduction of the Core portion of the Curriculum, also motivated by curriculum innovation and discussion at the

national level. The faculty has been actively discussing these issues for two and a half quarters and has voted favorably for the curriculum plan proposed in this document.

The table above in Section 8c summarizes the changes made in coverage in a specific set of categories. The significant changes are outlined below.

- More design in the curriculum
  - A new sophomore level design course has been added, which provides an early hands-on introduction to the design process applied to the various sub-disciplines of mechanical engineering.
  - Design exercises and projects will be incorporated more extensively in the technical elective program.
  - The Capstone design sequence is expanded to expose all students to a full design-build-test experience within the same broad framework. Five project areas, some of which will be newly developed, will be provided as choices. Less than 25% of students currently get the full experience. This change will require significant resources to which the department is committed.
- Improved lab experiences
  - A Junior level lab course will build upon the added statistics course. Further, experiments are included in the newly designed circuits course from ECE, and in the new sophomore level design course.
  - A new Senior level lab course is open-ended and will allow students to work on longer experimental projects which will also require them to make connections across the curriculum.
  - The new Manufacturing course worked out with ISE will incorporate experiments. It will also, by moving it to the senior year, allow for a much more rigorous treatment of manufacturing processes.
  - Faculty members will now be involved in all aspects of the laboratory courses and will establish stronger connection between lecture and laboratory.
- Better training in professional skills (engineering ethics, global skills, project management, entrepreneurship, environmental, economic, and societal considerations)
  - Oral and written communication skills will be formally taught in the sophomore year and then reinforced in a coordinated way in the junior and senior years through the new lab courses.
  - Teamwork skills will be better reinforced starting from the sophomore year and continuing with group project work in later courses.
  - The Technical Elective program will now require 2 credit hours of professional skills.
- Better development of engineering skills
  - *Design skills* are developed progressively from the sophomore design course to the design-oriented technical electives, and in the year-long capstone design experience.
  - *Open-ended problem solving skills* are cultivated by the senior lab course and the capstone and in certain core courses.
  - *Computational skills* are developed progressively from the freshmen program to the numerical methods course to the sophomore design course and finally to the computation-oriented technical electives.
  - *Experimental skills* are developed in a more coordinated way through the new lab courses.
  - *Communication skills* are developed more progressively with significant experience spread through years 2, 3 and 4.

- Improvements in basic science
  - The required amount of chemistry has been reduced and engineering biology, materials science and a second chemistry course are alternatives.
  - Linear algebra has been incorporated in the math sequence.
  - A stand-alone statistics course has been added.

11. BSME Program Credit Hour Table

Program credit hour requirements	A) Number of quarter credit hours in current program	B) Number of semester credit hours in current program	C) Number of credit hours in proposed program
Total credit hours required for completion of program	192	128.7	131
Required credit hours offered by the unit	82-88	55.3-59.3	55-58
Required credit hours offered outside the unit	104-110	69.3-73.3	73-76
Prerequisite credit hours required for admission to program which are not counted towards total hours	0	0	0

Note: The total number of hours a student must take is the sum of lines 1 and 2 above plus General Education hours, which was 23.4 semester hours and proposed is 24 semester hours.

12. Rationale for Program Credit Hour Changes of 4 Credit Hours or More

The Required Credit Hours outside the unit changed in many ways. The decreases were in chemistry (2 cr-hrs) and circuits (1 cr-hr). The increases were in the manufacturing course (1 cr-hr), additional science compared to materials only (2 cr-hrs), an estimated 2 cr-hr of outside technical electives, and the addition of the outside statistics course (2 cr-hrs).

13. Transition Policy

The Chair's Statement on the Transition Policy is attached at the end of the BSME portion document. The details are provided here.

The necessary bridge courses are identified in the following Table. In the Table, we have also identified the anticipated Math and Physics bridge courses. The anticipated number of semester credit hours is indicated in the table for each bridge course. The current quarter curriculum and proposed semester curriculum are shown in the "curriculum diagrams" in Figures 1 and 2. These diagrams show the terms that the various courses are taken for each system in addition to the prerequisite streams.

The transition from quarters to semesters will depend on the quarter that the student entered the university. Assuming that the students followed the recommended schedule, the first ME students who will be affected by the transition to semesters will have entered in the winter quarter of 2009. Therefore, transition plans must be developed for students who entered the university during 11 different quarters. The transition plans for these 11 groups of students are shown in the spreadsheet in Figure 3.

Bridge Courses Required for BSME Semester Curriculum

Bridge Course Name	Bridge Course Topics	Semester hours
ME 553 Bridge	The design component of ME 553	1
ME 562 Bridge	The part of ME 562 that is covered at the end of ME 3670	1
ME 563 Bridge	Topics from ME 563 that are covered at the end of ME 3671	1.5
ME 3360 Bridge	Topics in second third of ME 3200	1
ME 4360 Bridge	Topics from end of ME 3200 and second half of ME 4200	1
ME 502 Bridge	Topics from second half of ME 502	1
ME 504 Bridge	Topics from second half of ME 504	1

As indicated, of the eleven groups of students, five must take ME bridge courses before they can take the next semester course in a series. The semester or semester-equivalent credit hours are shown.

Some of the semester courses will be satisfied by either the quarter courses alone or with the quarter courses and bridge courses. When the semester course is satisfied in this manner, it is shown with a line through it in the spreadsheet. In these cases, the advising staff will indicate to the student's appropriate courses to take to replace the ones which have been satisfied.

The current ME quarter curriculum requires the equivalent of 128.67 semester hours, and it is assumed that the students entering prior to Autumn 2012 will elect to graduate under this requirement. Therefore in the spreadsheet, the number of total technical-elective hours has been adjusted so that the total number of semester hours in each case is between 128 and 129. As a result, students who follow the recommended schedule will not be required to take any more credit hours than will the students who graduated earlier under quarters.

Students who cannot or choose not to follow the standard schedule will be advised individually by the professional advising staff to minimize the effect of the transition. We will facilitate the transition by offering every required ME class as well as the ME bridge courses for both main semesters. If at the end of the first year, it appears that a significant number of students are still in transition between quarters and semesters, we will offer the needed bridge courses during the May term and the autumn semester of 2013.

We are also assuming that the General Education credit hours will be approximately the same under semesters as they were under quarters (35 quarter hours or 23.33 semester hours). Therefore, we are assuming that the students will be required to take approximately 23.33 semester hours during the transition, and some of these will be taken under quarters and some under semesters. Through careful advising, we expect that each student will be able to satisfy the hour's requirement regardless of the mix of quarter and semester courses.

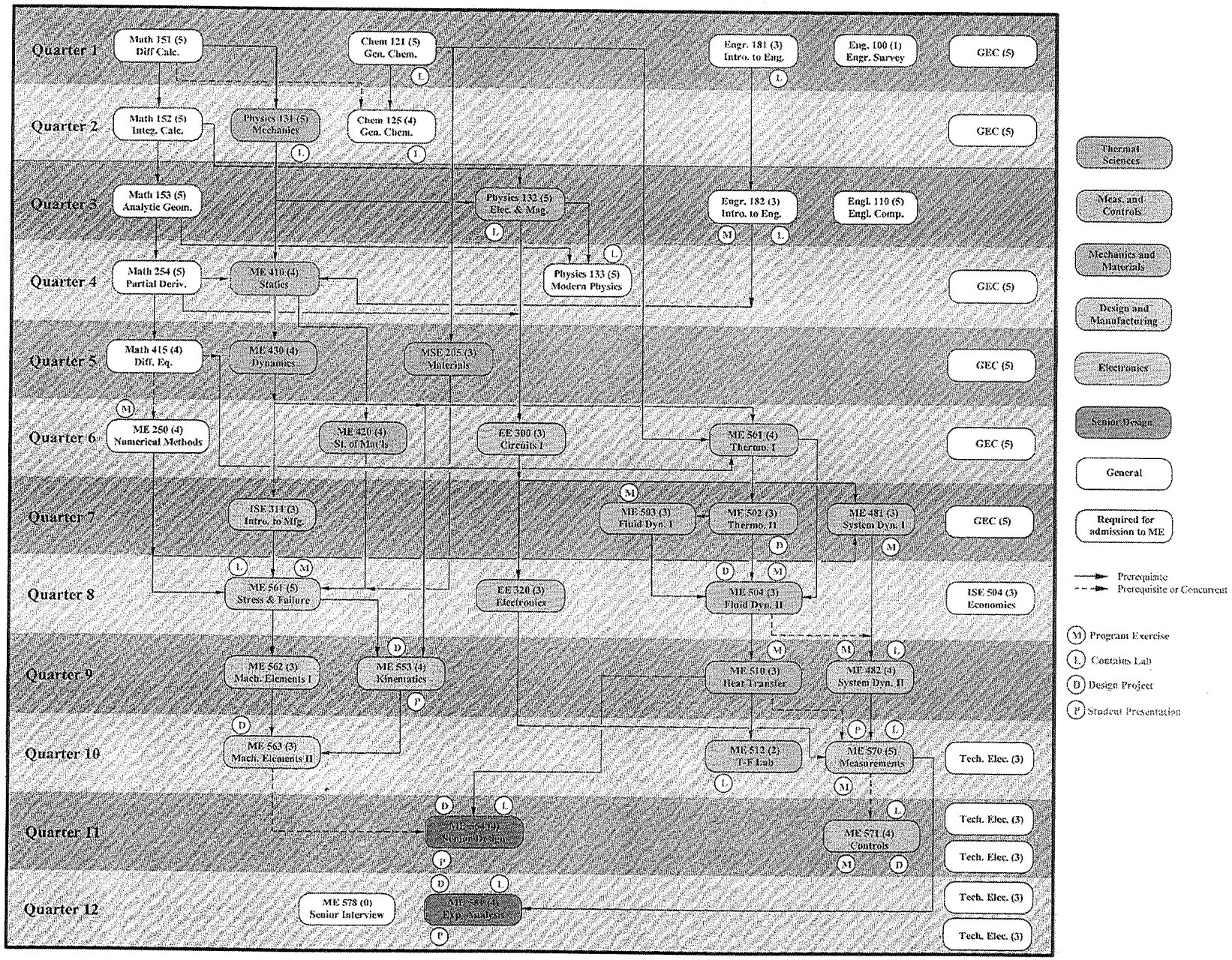
The schedules in Figure 3 show that students can graduate without taking more than 129 semester credit hours of courses. The summary of the GEC credit hours, the technical-elective (TE) credit hours, and general credit hours for each class of students during the transition are shown in the second last cell of each row on the second page of Figure 3. The actual hours may vary slightly depending on the availability of the General Education courses and TE classes with the shown number of credit hours. In the examples, it is assumed that appropriate 3- and 4-hour GEC courses will be available and appropriate 2-, 3-, 4-, and 5-hour TE classes will be available. This is likely to be the case given the variety of classes that are being discussed. Also, the exact credit hours

associated with the individual bridge course is not known at this time. If these vary from the assumed values, the TE hours will be adjusted further.

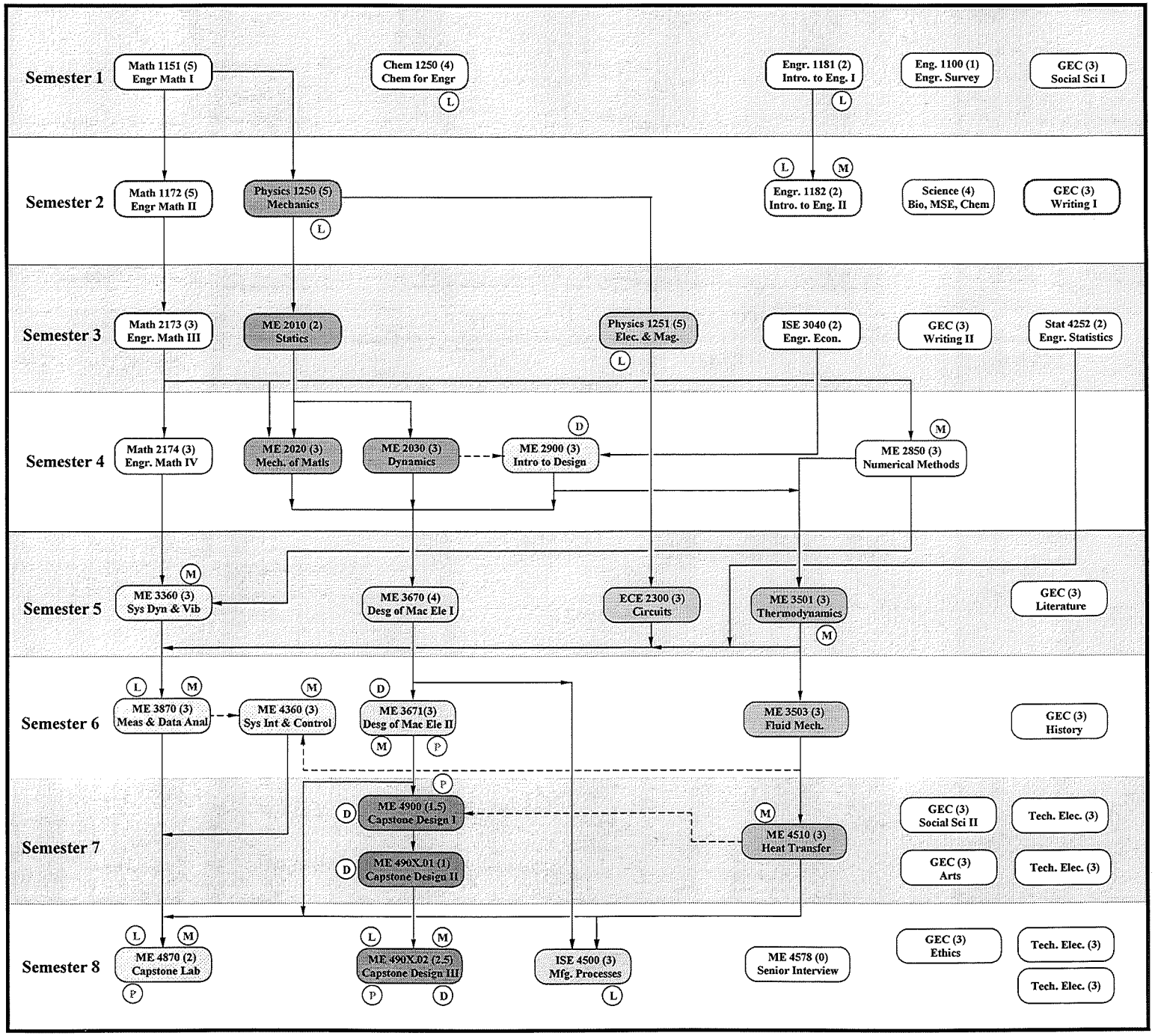
The nominal quarter of graduation for each class in the transition group is shown in the last cell in each row. These are based on each student's being in school for twelve quarters. It will be noted that no transition class is delayed more than half a semester from the original graduation time if the students had remained on quarters, and in some instances, the nominal graduation time is actually shorter than it would have been under quarters.

As indicated earlier, the transition students will require careful advising to ensure that they meet all of the university and department requirements. Because the TE classes can vary widely, it will be necessary to ensure that the ABET accreditation requirements on math and science (32 hours) and engineering topics (48 hours) are met for every student. This will be done explicitly during the graduation check out procedure done approximately nine months before graduation.

OSU Mechanical Engineering Curriculum Map - Quarters



OSU Mechanical Engineering Curriculum Map - Semesters



NFQF	1st Qtr in ME Major	Graduation Qtr	Where in Sem Plan in AU 12	WI 09 Q	SP 09 Q	AU 09 Q	WI 10 Q	SP 10 Q
AU 12	SP 14 (Sem)	SP 16	1/1					
SP 12	AU 13 (Sem)	SP 16	1/2					
WI 12	AU 13 (Sem)	AU 15	1/2					
AU 11	SP 13 (Sem)	SP 15	2/1					
SP 11	AU 12 (Sem)	SP 15	2/2					
WI 11	AU 12 (Sem)	AU 14	3/1					
AU 10	SP 12 (Qtr)	SP 14	3/1					
SP 10	WI 12 (Qtr)	SP 14	3/2					Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7)
WI 10	AU 11 (Qtr)	AU 13	3/2				Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)
AU 09	SP 11 (Qtr)	SP 13	4/1			Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)
SP 09	WI 11 (Qtr)	SP 13	4/1		Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)
WI 09	AU 10 (Qtr)	AU 12	4/2	Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)	Math 415 (2.7) ME 430 (2.7) MSE 205 (2) GEC (3.3)

Figure 3: Spreadsheet showing transition plan for students entering the university after Autumn 2008 (Pg 1 of 3)

AU 10 Q	WI 11 Q	SP 11 Q	AU 11 Q	WI 12 Q	SP 12 Q	Student Summary	Bridge Courses
						No requirements met through quarters	None
					Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	GEC - 3.3 hrs General 9.33	Math 1151 Bridge (1)
				Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	GEC - 6.66 hrs General 18.66	Physics 1151 Bridge (2)
			Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	GEC - 10 hrs General 27.32	None
		Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)	GEC - 13.32 hrs General 36.65	None
	Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)	Math 415 (2.7) ME 430 (2.7) MSE 205 (2) GEC (3.3)	GEC - 16.65 hrs General 43.99	Math 2XX2 Bridge (1)
Math 151 (3.3) Chem 121 (3.3) Engr 181 (2) Eng 100.12 (.7) GEC (3.3)	Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)	Math 415 (2.7) ME 430 (2.7) MSE 205 (2) GEC (3.3)	ME 250 (2.7) ME 420 (2.7) ME 501 (2.7) ECE 300 (2) GEC (3.3)	GEC - 19.98 hrs General 54	
Math 152 (3.3) Chem 125 (2.7) Physics 131 (3.3) GEC (3.3)	Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)	Math 415 (2.7) ME 430 (2.7) MSE 205 (2) GEC (3.3)	ME 250 (2.7) ME 420 (2.7) ME 501 (2.7) ECE 300 (2) GEC (3.3)	ME 481 (2) ME 502 (2) ME 503 (2) ISE 311 (2) GEC (3.3)	GEC - 23.31 hrs General 62	ME 504 Bridge (1) ME 3360 Bridge (1)
Math 153 (3.3) Physics 132 (3.3) Engr 183 (2) ENG 110 (3.3)	Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)	Math 415 (2.7) ME 430 (2.7) MSE 205 (2) GEC (3.3)	ME 250 (2.7) ME 420 (2.7) ME 501 (2.7) ECE 300 (2) GEC (3.3)	ME 481 (2) ME 502 (2) ME 503 (2) ISE 311 (2) GEC (3.3)	ME 504 (2) ME 561 (3.3) ECE 320 (2) ISE 504 (2)	GEC - 23.31 hrs General 71.33	ME 553 Bridge (1) ME 562 Bridge (1) ME 3360 Bridge (1)
Math 254 (3.3) ME 410 (2.7) Physics 133 (3.3) GEC (3.3)	Math 415 (2.7) ME 430 (2.7) MSE 205 (2) GEC (3.3)	ME 250 (2.7) ME 420 (2.7) ME 501 (2.7) ECE 300 (2) GEC (3.3)	ME 481 (2) ME 502 (2) ME 503 (2) ISE 311 (2) GEC (3.3)	ME 504 (2) ME 561 (3.3) ECE 320 (2) ISE 504 (2)	ME 562 (2) ME 553 (2.7) ME 510 (2) ME 482 (2.7)	GEC - 23.31 hrs General 80.7	ME 563 Bridge (1) ME 3360 Bridge (1) ME 4360 Bridge (1)
Math 415 (2.7) ME 430 (2.7) MSE 205 (2) GEC (3.3)	ME 250 (2.7) ME 420 (2.7) ME 501 (2.7) ECE 300 (2) GEC (3.3)	ME 481 (2) ME 502 (2) ME 503 (2) ISE 311 (2) GEC (3.3)	ME 504 (2) ME 561 (3.3) ECE 320 (2) ISE 504 (2)	ME 562 (2) ME 553 (2.7) ME 510 (2) ME 482 (2.7)	ME 563 (2) ME 512 (1.33) ME 570 (3.3) TE (2)	GEC - 23.31 hrs General 87.33 Tech Elect 2	ME 4360 Bridge (1)
ME 250 (2.7) ME 420 (2.7) ME 501 (2.7) ECE 300 (2) GEC (3.3)	ME 481 (2) ME 502 (2) ME 503 (2) iSE 311 (2) GEC (3.3)	ME 504 (2) ME 561 (3.3) ECE 320 (2) ISE 504 (2)	ME 562 (2) ME 553 (2.7) ME 510 (2) ME 482 (2.7)	ME 563 (2) ME 512 (1.33) ME 570 (3.3) TE (2)	ME 564 (2.7) ME 571 (2.7) TE (2) TE (2)	GEC - 23.31 hrs General 92.7 Tech Elect 6	None

Figure 3: Spreadsheet showing transition plan for students entering the university after Autumn 2008 (Pg 2 of 3)

AU 12 S	SP 13 S	AU 13 S	SP 14 S	AU 14 S	SP 15 S	AU 15 S	SP 16 S	
Math 1151 (5) Chem 1XXX (4) Engr 1181 (2) Eng 1100 (1) GEC (3)	Math 1152 (5) Physics 1151 (5) Engr 1182 (2) Science Course (4) GEC (3)	Math 2XX1 (3) Stat 4252 (2) ISE 3040 (2) ME 2010 (2) Physics 1152 (5) GEC (3)	Math 2XX2 (3) ME 2020 (3) ME 2030 (3) ME 2900 (3) ME 2850 (3)	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (3) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) GEC (3) GEC (3)	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) GEC (3) TE (3)	ME 490X.02 (2.5) ME 4870 (2) TE (3) TE (3) TE (3) ME 4578 (0)	GEC - 24 hrs General 95 Tech Elect 12 Total 131
Math 1152 (5) Physics 1151 (5) Engr 1182 (2) Science Course (4) GEC (3)	Math 2XX1 (5) Stat 4252 (2) ISE 3040 (2) ME 2010 (2) Physics 1152 (5) ~~GEC (3)~~	Math 2XX2 (3) ME 2020 (3) ME 2030 (3) ME 2900 (3) ME 2850 (3)	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (3) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) GEC (4) GEC (4)	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) GEC (3)	ME 490X.02 (2.5) ME 4870 (2) TE (3) TE (3) TE (4) ME 4578 (0)	GEC - 23.3 hrs General 95.33 Tech Elect 10 Total 128.66	Normal Grad Qtr Wi 16
Math 1152 (5) ~~Physics 1151 (5)~~ Engr 1182 (2) Science Course (4) GEC (3)	Math 2XX1 (5) Stat 4252 (2) ISE 3040 (2) ME 2010 (2) Physics 1152 (5) ~~GEC (3)~~	Math 2XX2 (3) ME 2020 (3) ME 2030 (3) ME 2900 (3) ME 2850 (3)	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (3) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) GEC (3) GEC (4)	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) GEC (4)	ME 490X.02 (2.5) ME 4870 (2) TE (3) TE (2) ~~TE (3)~~ ME 4578 (0)	GEC - 23.66 hrs General 100.66 Tech Elect 5 Total 128.32	Normal Grad Qtr Au 15
Math 2XX1 (5) Stat 4252 (2) ISE 3040 (2) ME 2010 (2) Physics 1152 (5) ~~GEC (3)~~	Math 2XX2 (3) ME 2020 (3) ME 2030 (3) ME 2900 (3) ME 2850 (3)	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (3) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) GEC (4) GEC (4)	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) GEC (3)	ME 490X.02 (2.5) ME 4870 (2) TE (4) TE (4) ~~TE (3)~~ ME 4578 (0)	GEC - 24 hrs General 96.32 Tech Elect 8 Total 128.32	Normal Grad Qtr -Sp 15	
Math 2XX2 (3) ME 2020 (3) ME 2030 (3) ME 2900 (3) ME 2850 (3)	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (4) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) GEC (3) GEC (3)	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) TE (3)	ME 490X.02 (2.5) ME 4870 (2) TE (4) TE (4) TE (4) ME 4578 (0)	GEC - 23.32 hrs General 89.68 Tech Elect 15 Total 128	Normal Grad Qtr - Wi 15		
~~Math 2XX2 (3)~~ ME 2020 (3) ~~ME 2030 (3)~~ ME 2900 (3) ME 2850 (3)	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (4) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) TE (3) TE (3)	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1)	ME 490X.02 (2.5) ME 4870 (2) TE (4) TE (3) ME 4578 (0)	GEC - 23.31 hrs General 92 Tech Elect 13 Total 128.31	Normal Grad Qtr - Au 14		
~~Math 2XX2 (3)~~ ~~ME 2020 (3)~~ ~~ME 2030 (3)~~ ME 2900 (3) ~~ME 2850 (3)~~	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (4) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) ~~GEC (3)~~ ~~GEC (3)~~	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) TE (4)	ME 490X.02 (2.5) ME 4870 (2) TE (3) TE (4) TE (4) ME 4578 (0)	GEC - 24 hrs General 89 Tech Elect 15 Total 128	Normal Grad Qtr - Sp 14		
~~Math 2XX2 (3)~~ ~~ME 2020 (3)~~ ~~ME 2030 (3)~~ ME 2900 (3) ~~ME 2850 (3)~~	ME 3360 (3) ME 3501 (3) ME 3670 (4) ECE 3XXX (3) GEC (4) GEC (3)	ME 3503 (3) ME 3671 (3) ME 3870 (3) ~~GEC (3)~~ ~~GEC (3)~~	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) TE (4)	ME 490X.02 (2.5) ME 4870 (2) TE (4) TE (4) ME 4578 (0)	GEC - 23.31 hrs General 93 Tech Elect 12 Total 128.31	Normal Grad Qtr - Wi 14		
~~ME 3503 (3)~~ ME 3671 (3) ME 3870 (3) ~~GEC (3)~~ ~~GEC (3)~~	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) TE (4)	ME 490X.02 (2.5) ME 4870 (2) TE (4) TE (4) ME 4578 (0)	GEC - 23.31 hrs General 93.3 Tech Elect 12 Total 128.64	Normal Grad Qtr - Au 13				
~~ME 3503 (3)~~ ~~ME 3671 (3)~~ ME 3870 (3) ~~GEC (3)~~ ~~GEC (3)~~	ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) GEC (3)	ME 490X.02 (2.5) ME 4870 (2) TE (3) TE (3) ME 4578 (0)	GEC - 23.31 hrs General 99.7 Tech Elect 6 Total 128.98	Normal Grad Qtr - Sp 13				
ME 4360 (3) ME 4510 (3) ISE 4500 (3) ME 4900 (1.5) ME 490X.01 (1) GEC (3)	ME 490X.02 (2.5) ~~ME 4870 (2)~~ TE (4) TE (4) TE (4) ME 4578 (0)	GEC - 23.31 hrs General 93.3 Tech Elect 12 Total 128.64	Normal Grad Qtr - Wi 13					
ME 490X.02 (2.5) ME 4870 (2) TE (2) ~~TE (3)~~ ~~TE (3)~~ ME 4578 (0)	GEC - 23.31 hrs General 97.17 Tech Elect 8 Total 128.48	Normal Grad Qtr- Au 12						

Figure 3 (cont'd): Spreadsheet showing transition plan for students entering the university after Autumn 2008 (Pg 3 of 3)

Student Quarter to Semester Transition Information

TRANSITION OCCURS SUMMER OF 2012

1ST REGULAR SEMESTER IS AUTUMN 2012.

For Pre-Major Students

Pre-Major Courses: See the College of Engineering site for information on how to transition your studies in Mathematics, Physics, Introduction to Engineering, and Freshman Engineering Honors (FEH). http://engineering.osu.edu/q2s/index.php

SPHR and Admittance to Major Guidelines

Under the Current Quarter System

1. Students must have at least a **C**umulative **P**oint **H**our **R**atio (CPHR) (i.e. overall GPA) of 2.0.

2. Students must have at least a **S**econdary **P**oint **H**our **R**atio (SPHR) (i.e. "special" GPA) of 2.0. The SPHR is the grade point average of the courses listed below. Applicants must have completed, or be in progress of completing, the following set of courses at the time of application.

- Math 151.0x , 152.0x, and 153.0x **or** Math 161.0x - 162.0x
- Math 254 **or** 253 ME 410 **or** H210
- Chem 121 and Chem 125 **or** 122
- Physics 131 and 132 Engineering 181.0x and 183.0x **or** Engineering 191.0x and 192.0**or** Engineering 185, 186, and 187
- English 110.0x (C- or above). This grade is not part of the SPHR.

The SPHR for a transfer student is based only on the SPHR courses taken at OSU. If any of the courses above are repeated, all grades are used to calculate the SPHR unless the grade is forgiven through the Freshman Forgiveness Rule (University Rule 3335-7-271)

If a student applies while "in progress" of completing the final SPHR course/s, admission to the major will be provisional. The provisional admission is finalized upon successful completion of the final (i.e. in progress) SPHR courses with at least a **"C" (2.0) average**. Failure to meet this minimum requirement at the end of the quarter will result in the cancellation of the admission to the major.

Under the Semester System

In the Semester system the five SPHR groups of courses are:

- Math 1151, 1152 and 2173
- Physics 1131 and 1132
- Eng 1181 and 1182
- Chem 1250
- ME 2010
- English 1st Writing Course (C- or above). This grades is not part of the SPHR.

The application process will remain the same, but with the semester SPHR groups of courses.

For Majors Students

Transition Advising Worksheets:

Once semesters begin, the old MAJOR degree requirements and courses will cease to exist. All students will finish their degree under the new Semester curriculum. In order to determine what semester courses to take in order to graduate, **Transition Advising Worksheets** will be provided. These worksheets will cover the ME core curriculum, technical electives, and GEC courses. Students will be expected to complete these forms before meeting with an academic advisor.

Academic Advisor Meeting

During this meeting students will present their Transition Advising Worksheets, and at this point the advisor will check the worksheets and amend as needed. Both student and advisor will sign the final version. The original will go into the student's file, and a copy will be given to the student.

Transition Courses:

In some cases the requirement will include a Transition Course, which covers topic/s that are lost in the transition because of the difference in timing and topics of the semester course sequences as compared to the quarter sequences. These topics are either important on their own or necessary for later course topics. The Transition Courses are: ME 3361, 4361, 3675. 3676. 3553. 3502, 3504, 4512 and 4564. Most of the Transition Courses will be 1 or 2 Semester credit hours and will be offered every semester for two years following the transition to semesters.

General Education Requirements:

Any student that is accepted into the College of Engineering prior to the start of semesters (summer 2012) will only be required to take a total of seven General Education courses using the same breadth distribution as under the quarter system. This will be in effect through spring semester 2017, at which time all students will be required to satisfy the semester General Education requirements.

Technical Electives:

Students will work with an academic advisor to determine the number of TEs to be taken. This will depend on a variety of factors, which include, but are not limited to, the number of ME required coursework hours completed through spring quarter 2012, ME core requirements needed for graduation, and any GECs that have yet to be completed.

Instructions for Filling out Your Transition Advising Plan (TAP)

1. Look at Column 1 (Topic Areas). This column lists 18 ME Major Course Requirement Areas

2. Look at Column 2 (I have taken…) and choose which of the possibilities apply to you

3. Look at Columm 3 (So I need to take…). These are the course/courses that you will need to take. Multiple courses in a sequence must be taken in sequence. Note that the first two courses in the Capstone Design sequence ME 4900 & ME 490X.01 must also be taken in sequence, but they are in the same semester (ME 4900 is the first seven weeks and ME 490X.01 is in the second seven weeks).

4. When you have gone through all 18 topics, you will have a list of all ME Major Core courses left to take.

Mechanical Engineering Program Transition Advising Plan (TAP)

Topic Area	I Have Taken…	So I Need to Take	Course/s I need to take
1.Statistics	None	STAT 4252	
	STAT 420 or 427	None	
2.Chemistry	None	CHEM 1250	
	CHEM 121	CHEM 1250	
	CHEM 125	None	
3.Materials/Additional Science	None	MSE 2010 OR BIO 1XXX, OR Any Chemistry beyond CHEM 1250	
	MSE 205	None	
4.Engineering Economics	None	ISE 3040	
	ISE 504	None	
5.Manufacturing	None	ISE 4500 (510 or 4510)	
	ISE 350 or 311	None	
6.Circuits	None.	ECE 3020	
	ECE 300 or ECE 320	None	
7.Soph Intro to Design	Have not taken ME 561	ME 2900	
	ME 561	None	
8.Numerical Methods	None	ME 2850	
	ME 250	None	
9.Statics	None	ME 2010	
	ME 410	None	
10.Mech. of Matls.	None	ME 2020	
	ME 420	None	
11.Dynamics	None	ME 2030	
	ME 430	None	
12.Systems/Controls/Msmnt	None	ME 3360, 3870, 4360, 4870	
	ME 481	ME 3361, 3870, 4360, 4870	
	ME 482	ME 3870, 4361, 4870	
	ME 570	ME 4361, 4870	
	ME 571	None	
13.Design Mach.Elements	None of 561, 562 or 563	ME 3670, 3671	
	ME 561	ME 3675, 3671	
	ME 562	ME 3676	
	ME 563	None	
14.Kinematics	None	ME 3553	
	ME 553	None	
15.Thermodynamics	None	ME 3501	
	ME 501	ME 3502	
	ME 502	None	
16.Fluid Mechanics	None	ME 3503	
	ME 503	ME 3504	
	ME 504	None	

17.Heat Transfer	None	4510	
	510	4512	
	512	None	
18.Capstone Design	None	ME 4900, 490X.01, 490X.02	
	ME 564 but not 581	ME 4870	
	ME 581 but not 564	ME 4564	
	ME 565.03	None	
	ENG 659.02	None	

Highlighted courses are transition courses

Semester Bingo Sheet

First Year

Fall Semester			Spring Semester		
Math 1151	Engineering Calculus I	5	Math 1152	Engineering Calculus II	5
Chem 1250	Chemistry for Engineers	4	Physics 1131	Physics 1	5
ENG 1181	Intro to Engineering 1	2	ENG 1182	Intro to Engineering 2	2
ENG 1100	Engineering Survey	1	Science: Biology or Materials (3) or Chemistry		4
Gen Ed	Writing Level 1	3	Gen Ed	Literature	3
	Total	15		Total	19

Second Year

Fall Semester			Spring Semester		
Math 2173	Engineering Math III	3	Math 2174	Engineering Math IV	3
Stat 4252	Statistical Methods for Engineers	2	ME 2020	Mechanics of Materials	3
ISE 3040	Engineering Economics	2	ME 2030	Dynamics	3
ME 2010	Statics	2	ME 2900	Intro to ME Design	3
Physics 1132	Physics 2	5	ME 2850	Numerical Methods in ME	3
Gen Ed	Writing Level 2	3			
	Total	17		Total	15

Third Year

Fall Semester			Spring Semester		
ME 3360/61	System Dynamics and Vibrations	3	ME 3503/04	Fluid Dynamics	3
ME 3501/02	Thermodynamics	3	ME 3671	Design Anal. Of Mach Elements II	3
ME 3670/75 or 76 or 3553	Design Anal. Of Mach Elements I	4	ME 3870	Msmnts and Data Analysis in ME	3
ECE 3XXX	Circuits	3	ME 4360/61	System Integration and Control	3
Gen Ed	Social Science 1	3	Gen Ed	Historical Study	3
	Total	16		Total	15

Fourth Year

Fall Semester			Spring Semester		
ME 4510/12	Heat Transfer	3	ME 490X.02	ME Capstone Design III	2.5
ME 4900	ME Capstone Design I (Week I-7)	1.5	ME 4870/4564 -	ME Capstone Laboratory	2
ME 490X.01	ME Capstone Design II (Week 8-14)	1	ISE 4500	Manufacturing Proc Engng	3
Technical Elective		3	Technical Elective		3
Technical Elective		3	Technical Elective		3
Gen Ed	Social Science 2	3	ME 4578 - Senior Exit Survey		0
Gen Ed	Arts	3	Gen Ed	Culture and Ideas: Ethics	3
	Total	17.5		Total	16.5

Highlighted courses are transition courses and have a different number of credit hours.

ME Program Coursework Projection Worksheet

Autumn Quarter 2011	Winter Quarter 2012	Spring Quarter 2012	Autumn Semester 2012	Spring Semester 20__	_____ Semester 20__	_____ Semester 20__	_____ Semester 20__	_____ Semester 20__	_____ Semester 20__

I have met with _____, discussed and understand my Transition Advising Plan, which includes the following topics:
Advisor Name

- ME major courses that need to be completed
- Technical Elective courses that need to be completed
- GEC courses that need to be completed

- Time to degree – I plan to graduate _____Semester 20_____

Additional Comments:

_____

_____

_____

_____

_____

_____ _____
Print Student Name **Student Signature** **Date**

_____ _____
Print Advisor Name **Advisor Signature** **Date**

14. Changes in Assessment Practices

Our assessment tools include alumni surveys, senior exit surveys, and interviews, student opinion of Course Objective achievement following every required course, and direct assessment of program outcomes by use of selected problems on midterm and final examinations. Since the curriculum changes outlined above involve almost all new courses in the major core course and consist of different combinations of topics than before, Course Objectives must be rewritten. We are also taking this opportunity to change the strategy of the direct assessment. In the past we have mapped particular embedded questions or assignments to Program Outcomes (see Section 6 and the Curriculum Map). This has given virtually no useful information in the quarters in which we have tried. It is probably because most of the core courses fall into only a few of the very broad program outcomes. We are instead going to take a two-level approach. First we will map Course Objectives to Program Outcomes. Then we will choose embedded questions aimed at one Course Objective at a time. This will be much more focused and should tell us where the problem areas are.

15. Assessment Plan

Submitted online and attached at the end of the BSME portion of this document.

Department of Mechanical Engineering

Peter L. and Clara M. Scott Laboratory
201 West 19th Avenue Suite N350
Columbus, OH 43210-1142

Phone (614) 292-2289
Fax (614) 292-3163
E-mail MEAdmin@mecheng.ohio-state.edu
www.mecheng.osu.edu

To: The Office of Academic Affairs

From: K. (Cheena) Srinivasan, Chairperson, Department of Mechanical Engineering

Date: May 18, 2010

Subject: **Department of Mechanical Engineering Quarters to Semesters Transition Statement**

The ME Department's transition plan is based on the premise that no ME major who began the degree program under quarters and who follows the recommended course schedule will have progress toward graduation impeded by the transition to semesters. Graduation requirements beginning Summer 2012 will be those in force for ME majors under semesters; but *every* quarter credit- hour that would have counted toward the ME major under the quarter-based ME program will count (as 2/3rds of a semester-credit-hour) toward the requirements for graduation under the semester-based ME program. If it is determined that the "normal" conditions covered by the generic ME major transition would result in a particular student facing an unavoidable delay in graduation compared to quarters, due to circumstances related to the change to semesters rather than the student's failure to make satisfactory progress through the program, then a revision of specific requirements will be worked out for that student by the advising staff with approval by the ME Undergraduate Studies Committee.

The transition policy is based on the following principles:

- The switch to semesters will not increase the number of credit hours that a student must take.
- All students who graduate under semesters may do so by satisfying either the requirements of the semester program or the quarter program that was in effect during Autumn quarter of 2010 or later.
- Semester program requirements may be met either by taking semester courses, or by substituting a substantially equivalent quarter course (or sequence) for the corresponding semester course (or sequence).
- Excess equivalent credit-hours resulting from such substitutions—either positive or negative—will be credited against technical elective requirements.
- Bridge courses will be offered to ease the transition from quarter courses to semester courses
- The preferred approach to "bridge courses" is to offer them just before the switch to semesters, rather than afterward.

It is anticipated that the bridge courses will be from 1 to 2 semester hours and will be offered in 7-week terms. These will be offered during the summer of 2012 and during the fall and spring semesters of the 2012 and 2013 academic year. Currently we estimate that the bridge courses will include two from Math, two from Physics, and seven from ME.

The Department recognizes the criticality of undergraduate student advising during the transition and is committed to creating a customized transition plan for each student based on one on one advising sessions. Additional advising support, in the form of Graduate Administrative Associates with appropriate training, will be provided for ME majors to assist in planning course schedules, during the last year of quarters (2011-2012) and at least the first year of semesters (2012-2013). The current faculty adviser system will also be able to contribute to the task. The resource details have not been worked out yet, but, the department is committed to providing the necessary advising for our students using either GAAs or additional temporary advising staff, or by whatever efficient means are necessary.

Assessment Plan Summary – Mechanical Engineering

Plan Abstract

Our assessment process includes the following inputs: A) Course Grades, B) External assessment of student skills in design courses, C) Course Surveys, D) Senior Exit Survey, E) Co-op Surveys, F) Alumni Survey, G) IAC input. The inputs are collected by the Undergraduate Studies Committee and presented to the faculty at a biennial meeting, during the winter quarter, dedicated to discussing the program. Objectives or outcomes that fall below accepted criteria are discussed and decisions are made to correct any shortcomings.

Learning Goals

1. Our students will develop strong physical insight on the fundamentals of present and future mecahnical, thermal, and fluid systems in a variety of mechanical engineering application areas
   - 1.1. Graduates have an ability to apply knowledge of mathematics, science, and engineering
   - 1.2. Graduates have an ability to design and conduct experiments, as well as to analyze and interpret data
   - 1.3. Graduates have an ability to apply principles of engineering, basic science, and mathematics to model and analyze components or processes
   - 1.4. Graduates have 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.
   - 1.5. Graduates have an ability to identify, formulate, and solve engineering problems.
   - 1.6. Graduates have an ability to work professionally in thermal systems area
   - 1.7. Graduates have an ability to work professionally in mechanical systems area
   - 1.8. Graduates have an broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
   - 1.9. Graduates have a knowledge of contemporary issues
2. Our students will learn to use analytical and computational methods for applying their knowledge in the fundamentals of the discipline to the solution of engineering problems, including the use of current experimental and data analysis techniques, and the design and realization of systems, components and processes
   - 2.1. Graduates have an ability to apply knowledge of mathematics, science, and engineering
   - 2.2. Graduates have an ability to design and conduct experiments, as well as to analyze and interpret data.
   - 2.3. Graduates have an ability to identify, formulate, and solve engineering problems.
   - 2.4. Graduates have an ability to apply principles of engineering, basic science, and mathematics to design and realize physical systems, components, or processes
   - 2.5. Graduates have 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
   - 2.6. Graduates have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
   - 2.7. Graduates have an ability to work professionally in the thermal systems area
   - 2.8. Graduates have an ability to work professionally in the mechanical systems area
3. Our students will learn to work collaboratively and creatively, and to communicate effectively, in applying discipline-specific knowledge in basic sciences and Mechanical Engineering.
   - 3.1. Graduates have an ability to function on multi-disciplinary teams
   - 3.2. Graduates have an ability to identify, formulate, and solve engineering problems
   - 3.3. Graduates have an understanding of professional and ethical responsibility
   - 3.4. Graduates have an ability to communicate effectively
   - 3.5. Graduates have an broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
   - 3.6. Graduates have a knowledge of contemporary issues.
4. Our students will understand the need for life-long learning and the responsibility of the engineer to behave professionally and ethically in the solution of societal problems.
   - 4.1. Graduates have an ability to function on multi-disciplinary teams
   - 4.2. Graduates have an understanding of professional and ethical responsibility
   - 4.3. Graduates have a recognition of the need for, and the ability to engage in life-long learning.

Means/Methods of Assessment

Direct Measures	***Indirect Measures***
Embedded testing	Student survey
Capstone Course	Alumni survey
	External program review
	Grade Review

Other Assessment Activities

Course redesign
Technical Elective Program Revisions
Experiemental Program Revisions

Plan/Report Details – Mechanical Engineering

<u>Goal 1:</u> Our students will develop strong physical insight in the fundamentals of present and future mecahnical, thermal, fluid and electrical systems in a variety of mechanical engineering application areas.

Methods: Means/Methods	All instruments are designed to measure specific learning objectives that support the learning goal. Some are administered quarterly and some annually. Quarterly: Embedded questions in courses, Senior Exit Surveys Yearly: Alumni Surveys, Student Course Surveys: The satisfaction of the objectives for every required course is student surveyed every quarter. The courses objectives are then mapped to the objectives listed under the goals to assess by objectives. The embedded questions are also aimed at specific objectives. Communication, teamwork and design skills are assessed by instructor observation and peer evaluations in the senior design courses. Grades in General Education courses are used for some objective assessment.
Criteria	Meeting success metrics on the following learning outcomes/objectives (selected from ABET Criterion 3 a-k) and Program Outcomes l-o) below: 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 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 l) an ability to apply principles of engineering, basic science, and mathematics to model and analyze components or processes, n)an ability to work professionally in the thermal systems area, o) an ability to work professionally in the mechanical systems area
Planned Use	The inputs are collected by the Continuous Quality Improvement Committee. Objectives or outcomes that fall below accepted criteria are discussed and decisions are made to correct any shortcomings. Where an objective is concerned, input from the External Advisory Committee is also sought and corrective action is taken by the faculty.
Implementation Schedule	Continuous with two or more meetings per quarter of the CQI Committee.

Objective 1.1: *Graduates have an ability to apply knowledge of mathematics, science, and engineering*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of

	70% or higher on embedded questions, A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.2: *Graduates have an ability to design and conduct experiments, as well as to analyze and interpret data*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.3: *Graduates have an ability to apply principles of engineering, basic science, and mathematics to model and analyze components or processes*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.4: *Graduates have 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.*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.5: *Graduates have an ability to identify, formulate, and solve engineering problems*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.6: *Graduates have an ability to work professionally in the thermal systems area*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions

Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.7: *Graduates have an ability to work professionally in the mechanical systems area*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.8: *Graduates have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.*

Methods: Means/Methods	Grades in GEC courses. Alumni survey. Senior exit survey.
Criteria	Average class grade of C+ in courses. Scores of 3.0 or above (on a 5 pt scale) for course survey and senior exit survey. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 1.9: *Graduates have a knowledge of contemporary issues.*

Methods: Means/Methods	Grades in GEC courses. Alumni survey. Senior exit survey.
Criteria	Average class grade of C+ in courses. Scores of 3.0 or higher (on a 5 pt scale) for senior exit survey. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

<u>Goal 2:</u> Our students will learn to use analytical and computational methods for applying their knowledge in the fundamentals of the discipline to solution of engineering problems, including the use of current experimental and data analysis techniques, and the modeling, design and realization of systems, components and processes

Methods: Means/Methods	All instruments are designed to measure specific learning objectives that support the learning goal. Some are administered quarterly and some annually. Quarterly: Embedded questions in courses, Senior Exit Surveys Yearly: Alumni Surveys, Student Course Surveys: The satisfaction of the objectives for every required course is student surveyed every quarter. The courses objectives are then mapped to the objectives listed under the goals to assess by objectives. The embedded questions are also aimed at specific objectives. Communication and teamwork type skills are

	assessed by instructor observation in the senior design courses. Grades in General Education courses are used for some objective assessment.
Criteria	Meeting success metrics on the following learning outcomes (selected from ABET Criterion 3 a-k) below: a) Graduates have an ability to apply knowledge of mathematics, science, and engineering b) Graduates have an ability to design and conduct experiments, as well as to analyze and interpret data c) Graduates have 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) Graduates have an ability to identify, formulate, and solve engineering problems l) an ability to apply principles of engineering, basic science, and mathematics to model and analyze components or processes, m) an ability to apply principles of engineering, basic science, and mathematics to design and realize components or processes, n)an ability to work professionally in the thermal systems area, o) an ability to work professionally in the mechanical systems area
Planned Use	The inputs are collected by the Continuous Quality Improvement Committee. Objectives or outcomes that fall below accepted criteria are discussed and decisions are made to correct any shortcomings. Where an objective is concerned, input from the External Advisory Committee is also sought and corrective action is taken by the faculty.
Implementation Schedule	Continuous with two or more meetings per quarter of the CQI Committee.

Objective 2.1: *Graduates have an ability to apply knowledge of mathematics, science, and engineering*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions, A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 2.2: *Graduates have an ability to design and conduct experiments, as well as to analyze and interpret data.*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 2.3: *Graduates have an ability to identify, formulate, and solve engineering problems*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded

	questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 2.4: *Graduates have an ability to apply principles of engineering, basic science, and mathematics to design and realize components or processes*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions. Instructor observations
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 2.5: *Graduates have 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*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 2.6: *Graduates have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 2.7: *Graduates have an ability to work professionally in the thermal systems area*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 2.8: *Graduates have an ability to work professionally in the mechanical systems area*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Goal 3: Our students will learn to work collaboratively and creatively, and to communicate effectively, in applying discipline-specific knowledge in basic sciences and Mechanical Engineering.

Methods: Means/Methods	All instruments are designed to measure specific learning objectives that support the learning goal. Some are administered quarterly and some annually. Quarterly: Embedded questions in courses, Senior Exit Surveys Yearly: Alumni Surveys, Student Course Surveys: The satisfaction of the objectives for every required course is student surveyed every quarter. The courses objectives are then mapped to the objectives listed under the goals to assess by objectives. The embedded questions are also aimed at specific objectives. Communication and teamwork type skills are assessed by instructor observation in the senior design courses. Grades in General Education courses are used for some objective assessment.
Criteria	Meeting success metrics on the following learning outcomes (selected from ABET Criterion 3 a-k) below: d) Graduates have an ability to function on multi-disciplinary teams e) Graduates have an ability to identify, formulate, and solve engineering problems f) Graduates have an understanding of professional and ethical responsibility g) Graduates have an ability to communicate effectively h) Graduates have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context j) Graduates have a knowledge of contemporary issues
Planned Use	The inputs are collected by the Continuous Quality Improvement Committee. Objectives or outcomes that fall below accepted criteria are discussed and decisions are made to correct any shortcomings. Where an objective is concerned, input from the External Advisory Committee is also sought and corrective action is taken by the faculty.
Implementation Schedule	Continuous with two or more meetings per quarter of the CQI Committee.

Objective 3.1: *Graduates have an ability to function on multi-disciplinary teams*

Methods: Means/Methods	Instructor observations. Peer evaluations. Student course survey. Alumni /Senior Exit survey.
Criteria	Team involvement is monitored continually and if there are problems the instructor corrects the situation. Scores of 3.0 (on a 5 point scale) or higher on surveys. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 3.2: *Graduates have an ability to identify, formulate, and solve engineering problems*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey. Embedded questions
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. Scores of 70% or higher on embedded questions. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 3.3: *Graduates have an understanding of professional and ethical responsibility*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey.
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 3.4: *Graduates have an ability to communicate effectively*

Methods: Means/Methods	Instructor observations. Peer evaluations. Student course survey. Alumni /Senior Exit survey.
Criteria	Team involvement is monitored continually and if there are problems the instructor corrects the situation. Scores of 3.0 (on a 5 point scale) or higher on surveys. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 3.5: *Graduates have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.*

Methods: Means/Methods	Grades in GEC courses. Alumni survey. Student course survey. Senior exit survey.
Criteria	Average class grade of C+ in courses. Scores of 3.0 or higher (on a 5 pt. scale) for course survey and senior exit survey. A rating of ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 3.6: *Graduates have a knowledge of contemporary issues.*

Methods: Means/Methods	Grades in GEC courses. Alumni survey. Student course survey. Senior exit survey.
Criteria	Average class grade of C+ in courses. Scores of 3.0 or higher (on a 5 pt. scale) for course survey and senior exit survey. A rating of ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Goal 4: Our students will understand the need for life-long learning and the responsibility of the engineer to behave professionally and ethically in the solution of societal problems.

Methods: Means/Methods	All instruments are designed to measure specific learning objectives that support the learning goal. Some are administered quarterly and some annually. Quarterly: Embedded questions in courses, Senior Exit Surveys Yearly: Alumni Surveys, Student Course Surveys: The satisfaction of the objectives for every required course is student surveyed every quarter. The courses objectives are then mapped to the objectives listed under the goals to assess by objectives. The embedded questions are also aimed at specific objectives. Communication and teamwork type skills are assessed by instructor observation in the senior design courses. Grades in General Education courses are used for some objective assessment.
Criteria	Meeting success metrics on the following learning outcomes (selected from ABET Criterion 3 a-k) below: d) Graduates have an ability to function on multi-disciplinary teams f) Graduates have an understanding of professional and ethical responsibility i) Graduates have a recognition of the need for, and an ability to engage in life-long learning
Planned Use	The inputs are collected by the Continuous Quality Improvement Committee. Objectives or outcomes that fall below accepted criteria are discussed and decisions are made to correct any shortcomings. Where an objective is concerned, input from the External Advisory Committee is also sought and corrective action is taken by the faculty.
Implementation Schedule	Continuous with two or more meetings per quarter of the CQI Committee.

Objective 4.1: *Graduates have an ability to function on multi-disciplinary teams*

Methods: Means/Methods	Instructor observations. Peer evaluations. Student course survey. Alumni /Senior Exit survey.
Criteria	Team involvement is monitored continually and if there are problems the instructor corrects the situation. Scores of 3.0 (on a 5 point scale) or higher on surveys. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 4.2: *Graduates have an understanding of professional and ethical responsibility*

Methods: Means/Methods	Student course survey. Alumni /Senior Exit survey.
Criteria	Scores of 3.0 (on a 5 point scale) or higher on surveys. A rating for ability within plus or minus 0.5 of the rating for importance on alumni survey.
Planned Use	
Implementation Schedule	

Objective 4.3: *Graduates have a recognition of the need for, and an ability to engage in life-long learning.*

Methods: Means/Methods	Grades in GEC and design courses. Alumni /Senior Exit survey.
Criteria	Average class grade of C+ in courses. Scores of 3.0 or higher (on a 5 pt. scale) for course survey and senior exit survey. A rating of ability within plus or minus 0.5 of the rating of importance on alumni survey.
Planned Use	
Implementation Schedule	