MassTransfer A2B Pathways
Engineering Group
Fitchburg State University
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Leaders:

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1. Elena convened the meeting and welcomed all and began with a brief overview of the MassTransfer Program components, using a PowerPoint presentation.

   i. MassTransfer Course Equivalency Database:

      i. Over 10,000 courses in the database
      ii. Annual updating process in place
      iii. Continue to expand the database

   ii. MassTransfer General Education Foundation (formerly MassTransfer Block):

      i. English Composition/Writing .... 6 credits
      ii. Behavioral/Social Sciences... 9 credits
      iii. Humanities/Fine Arts .... 9 credits
      iv. Mathematics/Quantitative Reasoning........................... 3 credits
      v. Natural/Physical Sciences .... 7 credits
      Total: .... 34 credits

      vi. Elena explained that it's uncertain that the Engineering Pathway will include the Gen Ed Foundation. It seems likely that it will not. The Behavioral/Social Sciences and Humanities/Fine Arts elements likely will be reduced from 9 to 6 credits each.

   iii. Elena reminded the group of the Cycle II A2B Pathways.

      i. Engineering
      ii. Early Childhood Education
      iii. Art
      iv. Physics

2. Elena outlined the goals and process for the day.

   i. The group will break into two sub-groups based on faculty expertise and will discuss the content of the identified Engineering foundational courses.

   ii. The Digital Logic course falls under the oversight of the Computer Science faculty. Similarly Physics, Chemistry and Mathematics courses fall under the oversight of their respective faculties.

iii. Today the group will focus on the most common Engineering courses required in Engineering programs across the state. The group's discussions will not include ancillary courses such as Computer Science, Physics, Chemistry and Mathematics. The goal will be to identify the necessary content of the core Engineering courses, regardless of Engineering concentration.

iv. The ancillary courses in Engineering consist of the following.

i. Mathematics.. 11 credits
(Calculus I, Calculus II, Calculus III and/or Differential Equations)
ii. Physics .... 8 credits
iii. Chemistry/Biology .... 8 credits
iv. English Composition/Writing.. 6 credits
v. Liberal Arts... 6 credits
Total:.. 39 credits

v. The Introduction to Engineering course is taught so differently across the state that it will not be included in today's discussions. This approach allows institutions to determine the content that is most appropriate for their campuses.

vi. The total of 39 credits for ancillary courses leaves 21 credits for Engineering courses in order for students to complete the associate's degree in 60 credits.

3. Elena explained that the Commonwealth Commitment did not originally and does not currently include the Engineering A2B Pathway, but it may be extended to Engineering in the future.

4. Through Reverse Transfer, students who made progress toward an associate's degree prior to transferring may apply credit earned at a four-year institution back to their community colleges to complete the associate's degree requirements. Elena explained the key eligibility requirements of the program. Students must:

i. Have matriculated into an associate's degree program at a Massachusetts community college;
ii. Have earned at least 30 college-level credits at their former community colleges before matriculating at their current Massachusetts state university or UMass campus;
iii. Have earned a cumulative grade point average of at least 2.00 at their former community colleges;
iv. Not have earned their associate's degrees before matriculating at their current state university or UMass campus;
v. Be in good financial standing at both their former community colleges and their current state university or UMass campus;
vi. Earn grades on courses taken at their current state university or UMass campus sufficient to meet their former community colleges' transfer credit minimum grade requirements; and
vii. Complete the associate's degree requirements of the program in progress at the time they transferred to their current state university or UMass campus or a Liberal Arts/General Studies program.

5. Elena invited questions from the group.

i. Will there be a minimum grade point average required in Engineering courses at the community colleges? *Answer:* This issue should be part of the conversations.

ii. Do students have to start their Engineering programs in the fall semester? *Answer:* No. Students may start in either the fall or spring semesters.

iii. What happens when students start in the spring semester and their sequence of courses is off? *Answer:* DHE will need to consider the possibility of expanding the Commonwealth Commitment to include Engineering and perhaps adjusting the timelines for completion of degrees as a result of the sequencing issue.

6. The group broke into two sub-groups at 10:43 a.m.

7. Group A (John McKelliget, University of Massachusetts Lowell, Leader): Group A identified the following components for Dynamics, Materials Science, Statics and Strength of Materials:

i. Dynamics:

    i. Review of rectilinear kinematics (position, velocity, acceleration) of a point
    ii. Vector definition of position, velocity and acceleration of a point
    iii. Cylindrical polar coordinates.
    iv. Normal and tangential acceleration of a point
    v. Relative position, velocity, and acceleration of two points
    vi. Vector equation relating velocity of two points on a rigid body
    vii. Vector equation linking the acceleration of two points on a rigid body
    viii. Review of Newton's Law for a particle
    ix. Review of rationalized systems of units
    x. Extension of Newton's Law to a system of particles and rigid bodies
    xi. Vector definition of angular velocity and acceleration
    xii. M = I alpha for a rigid body in planar motion
    xiii. Rolling/sliding/gears
    xiv. Calculation of the moment of inertia of a rigid body and application of the parallel axis theorem and the calculation of composite bodies
    xv. Review of work energy for a particle
    xvi. Work/energy for a rigid body
    xvii. Impulse Momentum and Angular Impulse and Angular momentum
    xviii. Conservation of momentum and angular momentum of a rigid body
    xix. Analysis of the motion of single rigid bodies in general plane motion
    xx. Optional : Analysis of four-bar linkage, slider/crank mechanism
    xxi. Optional: Rotating frames and rotating sliders.

ii. Materials Science:

i. Types of atomic bond
ii. Crystal structure
iii. Defects and dislocations
iv. Non-crystalline materials.
v. Microstructure-property-processing relationships of metals and metal alloys
vi. Phase equilibrium diagrams
vii. Diffusion in materials
viii. Heat treatment
ix. Elastic Deformation
x. Elastic modulus
xi. Yield strength
xii. Poisson's ratio
xiii. Plastic deformation
xiv. Basic failure mechanisms
xv. Stress/strain and strain gages (instructor discretion)
xvi. Mechanical testing (e.g. hardness, impact)
xvii. Corrosion and oxidation
xviii. Thermal properties
xix. Polymers
xx. Ceramics
xxi. Composites (at instructor's discretion)
xxii. Uses/applications of different materials
xxiii. Economic/environmental impact of materials.(Content and level at discretion of instructor)

iii. Statics:

i. Graphical and component manipulation of vectors
ii. Graphical and component calculation of dot and cross product
iii. Graphical and component calculation of the moment of a force about a point
iv. Reduction of simple distributed loadings to an equivalent resultant force, position of application of equivalent force, and equivalent moment
v. Recognize two-force members and to use this concept in the analysis of trusses, frames, and machines
vi. Selection and isolation of free bodies, and construction of free body diagrams
vii. Use of the equations of equilibrium to calculate appropriate reaction forces and moments for statically determinate structures
viii. Isolation of a frame or machine to construct Free Body Diagrams and to calculate the static equilibrium loading on each member
ix. Application of the Method of Joints and the Method of Sections to analyze forces in rigid truss networks
x. Identification of statically determinate and statically indeterminate structures
xi. Use of the Method of Sections to determine the internal shear and moment at a point in a loaded member

xii. Analysis of the equilibrium of rigid bodies subjected to frictional forces
xiii. Determination of the centroid and area moment of inertia of combinations of simple shapes

iv. Strength of Materials:

i. Required:

a. Average normal and shear stress on a surface
b. Axial tension test
c. Stress and strain in axial loading (emphasis on free body diagrams)
d. Thermal effects
e. Solution of statically indeterminate systems
f. Definition and symmetry of shear strain
g. Shear stress and angle of twist in torsional loading (emphasis on free body diagrams)
h. Normal stress in beams due to moments
i. Shear/Moment diagrams
j. Stresses due to shear forces in a beam
k. Calculation of beam deflection by superposition
l. Design of simple beams

ii. Optional:

a. Combined loading
b. Mohr's Circle for Stress
c. Mohr's Circle for Strain
d. Buckling

8. Group B (Rick Bsharah, Cape Cod Community College, Leader):

i. Rick explained that the group has been asked to identify the core components of CAD, Circuit Analysis and Thermodynamics courses. He reminded the group that there are only 21 credits remaining in students' schedules for Engineering courses, after all of the ancillary courses are included. He acknowledged that currently some community colleges may require more than 60 credits to complete the Engineering degree.

ii. A question arose about whether the group was to make a generic pathway or different pathways for Engineering concentrations. Rick answered that his understanding is that the group is expected to develop a generic Engineering pathway, although the core courses of the Engineering concentrations may be considered.

iii. The group noted the importance of being clear with students that they may need more than two years to complete the bachelor's degree. Students' credit loads may be higher at the university level than at the community college level.

iv. The group acknowledged that entry points may need to be discussed. Students may have to transfer in the fall semester in order to avoid problems with course sequencing. The entry points may have to be concentration-specific.

v. CAD (Computer-Aided/Assisted Drafting/Design, Engineering Design):

   i. Rick asked the group if the 10 identified components of a CAD course make sense. Are there other components to add? Are there components to drop?
   ii. Rick reminded the group that it is not trying to cover every concentration, but rather an introductory course in CAD.
   iii. Sub-group B concluded that it might be more appropriate to refer to the course as "Introduction to Engineering Design."
   iv. Sub-group identified the following Core Course Components of "Introduction to Engineering Design:

      a. Required:

         1) Coordinate systems, geometric relationships (such as tangents, concentric, coincident, collinear, symmetric)
         2) Isometric, diametric, and trimetric views, 2D orthographic projections
         3) Geometric dimensioning and tolerancing (GD&T)
         4) Constructive solid geometry (CSG)
         5) Scaling design/parametric modeling
         6) Engineering drawing standards
         7) Principles of design and testing of mechanisms
         8) Introduction to the principles of engineering design process

      b. Optional:

         9) Principles of design for manufacturability (additive and subtractive manufacturing, molds, vacuum forming)
         10) Principles of design for sustainability

vi. Some members of sub-group B expressed their belief that another round of feedback from the campuses will be necessary to review the conclusions of their work today.

vii. Sub-group B continued to work through lunch to complete their consideration of the courses.

viii. Circuit Analysis (Circuit Theory I): Sub-group B identified the following core course components (all required):

   i. Charge, current, voltage, and power
   ii. Ohm's Law and Kirchoff's Laws
   iii. Loop/mesh and nodal analysis
   iv. DC resistive circuit analysis using network theorems such as superposition, Thevenin's Theorem, and Norton's Theorem
   v. Inductance and capacitance, including time varying functions

vi. DC and transient circuits; RC, RL, and RLC circuits
vii. Multimeter and oscilloscope usage
viii. Concepts of operational amplifier (op-amp) circuits
ix. Computer-based circuit simulation

ix. Thermodynamics: Sub-group B identified the following core course components (all required):

i. Concepts of thermodynamics, pressure, volume, temperature, systems of measure and ideal gasses
ii. First Law of Thermodynamics
iii. Second Law of Thermodynamics
iv. Work, heat, energy and how they apply to open (flow) and closed (non-flow) systems
v. Carnot Cycle for an Ideal Gas
vi. Energy conservation, enthalpy and specific heat and applying them using the Energy Equation
vii. Efficiency and entropy and how they apply to reversible and irreversible cycles
viii. Concepts of phase, phase change (vaporization), vapor power cycles
ix. Specific heat, gas constants and partial pressure and applying them to a variety of processes using Ideal Gas Law
x. Heat engines, refrigeration, heat pumps and their efficiencies
xi. Heat transfer: conduction, convection and radiation

9. Following lunch Elena reconvened the meeting with sub-groups A and B together again at 1:01 p.m.
10. The group developed the identified the following core course components (all required) for Circuit Theory II:

i. Sinusoidal steady-state analysis
ii. AC Circuit power analysis
iii. Polyphase circuits
iv. Magnetically coupled circuits
v. Complex frequency and Laplace transform
vi. Circuit analysis and the s-Domain
vii. Frequency response: Bode diagram
viii. Fourier circuit analysis

11. The group considered the following table of foundational course applicability.

Foundational Course	***Chemical Engineering***	***Civil Engineering***	***Electrical Engineering***	***Mechanical Engineering***
Engineering Design (CAD)		X		X
Statics		X		X
Strength of Materials[1]		X		X
Dynamics		X		X
Thermodynamics	X			X
Materials Science[1]				X
Circuit Theory I and II			X[2]	X[3]

Data Structures			X	
Digital Logic			X	

[1] UMass Dartmouth requires labs for civil engineering.
[2] Both Circuit Theory I and Circuit Theory II required.
[3] UMass Dartmouth requires only Circuit Theory I.

a. The group noted that the Introduction to Engineering Design course needs to go back to all four university campuses for review.

b. The table above reflects the difficulty of creating a general engineering transfer program for the community colleges. The group acknowledged that some community college courses may have trouble transferring.

c. The group suggested adding a note to the Course Equivalency Search page of the MassTransfer website to remind students that it is important for students to meet with academic advisors. [Currently the "Look Up Individual Courses" section of the website includes the following notes:

> Check to see if individual courses will be accepted for transfer at your next campus.
>
> Transfer of credit at the discretion of the receiving institution.
>
> The online course equivalency database allows you to search for equivalent courses among our public community colleges, state universities and UMass campuses.
>
> It is meant to assist with transfer planning, but the information presented here is subject to change and is not a guarantee of acceptance or transferability. Please see your academic program advisor for official equivalency and transfer information.

12. The group indicated that the Digital Logic course for Engineering is not the same as the Digital Logic course for Computer Science. The Digital Logic course for Engineering needs to include digital electronics and digital computer systems. The Engineering faculty need to review the components of the Digital Logic course for Computer Science. Some components may need to be added to the Digital Logic course for Computer Science in order to meet the requirement for Engineering.

13. The group affirmed that the Circuit Theory II course requires a laboratory.

14. Elena asked the community colleges to confirm that their Engineering courses meet the minimum requirements identified for each course. The tables on the following pages report their responses.

***Community College Alignment Course:* <u>Introduction to Engineering Design</u>**					
	Foundational Courses		***Adequately addresses essential core components***		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire	ENT 122	Computer-Aided Drafting/Design I		X	
Bristol	CAD 101	Computer-Aided Design		X	
Bunker Hill	ENR 103	Fundamentals of Computer-Aided Drawing and Design		X	Needs more information
Cape Cod	CON 130	Computer-Aided Drafting I		X	
Cape Cod	CON 135	Computer-Aided Drafting II		X	
Cape Cod	ENR 102	3D Mechanical Design I	X		
Cape Cod	ENR 104	3D Mechanical Design II		X	
Greenfield	EGR 107	Engineering Graphics	X		
Holyoke	EGR 205	Engineering Drawing with CAD		X	
Massasoit	ENGT 107	Computer-Aided Drafting		X	
MassBay	MN 101	Introduction to CAD		X	
MassBay	MN 130	Engineering Design with CAD I	X		
MassBay	MN 135	Engineering Design with CAD II		X	
MassBay	MN 140	Architecture and Civil CAD Applications	X		
Middlesex	CAD 115	Introduction to Computer-Aided Design			Will need to get back to Elena
Mount Wachusett	CAD 101	Introduction to CAD	X		
North Shore	CAD 101	Principles of CAD 1		X	
North Shore	CAD 102	Principles of CAD 2		X	
Northern Essex	EST 111	Computer-Aided Drafting I			No one present to respond
Northern Essex	EST 112	Computer-Aided Drafting II			No one present to respond
Quinsigamond	EGR 101	Engineering Graphics	X		
Quinsigamond	MNT 101	Mechanical CAD I		X	
Quinsigamond	MNT 102	Mechanical CAD II		X	
Roxbury	EGR 121	Engineering Design	X		
Roxbury	TEC 121	Introduction to Engineering Design I/AutoCAD	X		Does not appear on Roxbury website
Springfield	EGR 103	Computer Applications in Engineering	X		
Springfield	MET 180	Mechanical CAD: 2D Fundamentals	X		Will tweak to ensure all is included; currently 85-90% is included

Community College Alignment Course: <u>Circuit Analysis I (with lab)</u>					
	Foundational Courses		***Adequately addresses essential core components***		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire	ENT 203	Linear Circuit Analysis I	X		
Bristol	EGR 131	Introduction to Electrical Circuits			No one present to respond
Bunker Hill	EPU 104	AC Circuit Theory/Lab		X	
Bunker Hill		Circuit Theory I	X		Could not find on website
Cape Cod	ENR 105	Circuit Theory and Analysis	X		
Greenfield	EGR 211	Circuit Analysis I	X		
Holyoke	EGR 109	Introduction to Electronic Digital Circuits with Verilog	X		
Holyoke	EGR 223	Systems Analysis: Circuit Analysis I	X		
Massasoit	ENGT 111	Electrical Circuits I		X	
Massasoit	ENGT 270	Engineering Circuit Theory I	X		
MassBay	EE 110	Circuit Analysis I			Not considered at meeting on 3-24-17
MassBay	MN 150	Printed Circuit Design I		X	
Middlesex	NST 101	Principles of Electric Circuits			Will need to get back to Elena
Mount Wachusett					
North Shore	EGS 211	Introductory Circuit Theory 1 and Laboratory	X		
Northern Essex	EST 231	Engineering Circuit Analysis I			No one present to respond
Quinsigamond					Offered in Physics III
Roxbury					
Springfield	EGR 221	Circuit Analysis 1	X		

Community College Alignment Course: <u>Circuit Analysis II</u>					
	Foundational Courses		***Adequately addresses essential core components***		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire	ENT 204	Linear Circuit Analysis II	X		
Bristol	EGR 133	Electrical Circuits			No one present to respond
Bunker Hill					
Cape Cod					
Greenfield	EGR 212	Circuit Analysis II	X		
Holyoke	EGR 224	Systems Analysis: Circuit Analysis I	X		
Massasoit	ENGT 112	Electrical Circuits II		X	
Massasoit	ENGT 271	Engineering Circuit Theory II	X		
MassBay	EE 115	Circuit Analysis II	X		
MassBay	MN 155	Printed Circuit Design II		X	
Massasoit	ENGT 270	Engineering Circuit Theory I	X		
MassBay	MN 150	Printed Circuit Design I		X	
Middlesex					Will need to get back to Elena
Mount Wachusett					
North Shore	EGS 212	Introductory Circuit Theory 2 and Laboratory	X		
Northern Essex	EST 232	Engineering Circuit Analysis II			No one present to respond
Quinsigamond					Offered in Physics III
Roxbury					
Springfield	EGR 222	Circuit Analysis 2	X		

Community College Alignment Course: **Dynamics**					
	Foundational Courses		***Adequately addresses essential core components***		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire	ENT 213	Dynamics	X		
Bristol					
Bunker Hill	ENR 265	Engineering Dynamics	X		
Cape Cod					Going through the curriculum process now
Greenfield	EGR 209	Dynamics	X		
Holyoke	EGR 209	Dynamics	X		Have not offered it recently, but it is still in the catalog
Massasoit	ENGT 274	Engineering Dynamics	X		
MassBay	MN 204	Engineering Mechanics: Dynamics	X		
Middlesex	EGR 212	Dynamics	X		
Mount Wachusett					
North Shore	EGS 202	Dynamics	X		
Northern Essex	EST 212	Engineering Mechanics II – Dynamics			No one present to respond
Quinsigamond					
Roxbury					
Springfield	EGR 122	Mechanics 2 (Dynamics)	X		

Community College Alignment Course: **_<u>Thermodynamics</u>_**					
	Foundational Courses		***Adequately addresses essential core components***		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire					
Bristol	EGR 255	Thermodynamics			No one present to respond
Bunker Hill					
Cape Cod					Going through the curriculum process now
Greenfield	EGR 210	Thermodynamics	X		
Holyoke	EGR 250	Thermodynamics	X		
Massasoit	ENGT 276	Engineering Thermodynamics	X		
MassBay	MN 220	Thermodynamics I	X		
Middlesex					
Mount Wachusett					
North Shore	EGS 214	Thermodynamics	X		
Northern Essex					
Quinsigamond	EGR 223	Thermodynamics	X		
Roxbury					
Springfield	EGR 229/230	Engineering Thermodynamics 1 with Computational Lab	X		

***Community College Alignment Course:* <u>Materials Science</u>**					
	Foundational Courses		***Adequately addresses essential core components***		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire					
Bristol	EGR 172	Material Science			No one present to respond
Bunker Hill					
Cape Cod					
Greenfield	EGR 223	Introduction to Material Science	X		
Holyoke	EGR 203	Introduction to Material Science			Will need to get back to Elena
Massasoit	ENGT 272	Engineering Materials	X		
MassBay					
Middlesex					
Mount Wachusett					
North Shore	EGS 206	Materials Science	X		
Northern Essex	EST 114	Material Science			No one present to respond
Quinsigamond	EGR 211	Introduction to Materials Science	X		
Roxbury					
Springfield	EGR 111	Introduction to Materials Science and Engineering	X		

Community College Alignment Course: Strength of Materials (without lab)					
	Foundational Courses		*Adequately addresses essential core components*		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire	ENT 214	Strength of Materials	X		
Bristol	EGR 272	Strength of Materials			No one present to respond
Bunker Hill	ENR 270	Strength of Materials	X		
Cape Cod					
Greenfield	EGR 206	Strength of Materials	X		
Holyoke	EGR 222	Mechanics II (Strength of Materials)			Will need to get back to Elena
Massasoit	ENGT 275	Strength of Materials	X		
MassBay	MN 210	Strength of Materials I	X		
MassBay	MN 222	Strength of Materials II		X	
Middlesex	EGR 211	Strength of Materials	X		
Mount Wachusett					
North Shore	EGS 204	Strength of Materials	X		
Northern Essex	EST 213	Strength of Materials			No one present to respond
Quinsigamond	EGR 225	Strength of Materials	X		
Roxbury	EGR 219	Strength of Materials (with lab)	X		Could not find on website
Springfield	EGR 219/219L	Mechanics of Materials and Lab	X		

Community College Alignment Course: ***Statics***					
	Foundational Courses		***Adequately addresses essential core components***		
Community College	***Course Code***	***Course Title***	***Yes***	***No***	***Information Required***
Berkshire	ENT 212	Statics	X		
Bristol	EGR 251	Statics			No one present to respond
Bunker Hill	ENR 260	Engineering Statics	X		
Cape Cod	ENR 201	Statics	X		
Greenfield	EGR 205	Statics	X		
Holyoke	EGR 221	Mechanics (Statics)	X		
Massasoit	ENGT 273	Statics	X		
MassBay	MN 203	Engineering Mechanics: Statics	X		
Middlesex	EGR 210	Statics	X		
Mount Wachusett					
North Shore	EGS 201	Statics	X		
Northern Essex	EST 211	Engineering Mechanics I – Statics			No one present to respond
Quinsigamond	EGR 221	Statics	X		
Roxbury					
Springfield	EGR 121	Mechanics 1 (Statics)	X		

15. Elena asked the UMass campuses to confirm their foundational courses for the Engineering Pathway. The following table reports their responses.

				Foundational Courses	
Course	***Campus***	***Course Code***	***Course Title***	***Yes***	***No***
Circuit Analysis I	Amherst	ENG 211	Circuit Analysis I	X	
	Boston	ENGIN 231/271	Circuit Analysis I/Lab		
	Dartmouth	ECE 201	Circuit Theory I	X	
	Lowell	EECE 2010/2070	Circuit Theory I/Lab		
Circuit Analysis II	Amherst	ENG 212	Circuit Analysis II		
	Boston	ENGIN 231/272	Circuit Analysis II/Lab		
	Dartmouth	ECE 202	Circuit Theory II		
	Lowell	EECE 2020/2080	Circuit Theory II/Lab		
Dynamics	Amherst	MIE 310	Dynamics	X	
	Boston	ENGIN 222	Dynamics		
	Dartmouth	EGR 242	Engineering Mechanics I - Dynamics	X	
	Lowell	ENGN	Dynamics	X	

				Foundational Courses	
Course	***Campus***	***Course Code***	***Course Title***	***Yes***	***No***
Statics	Amherst	CEE 240	Statics		
	Amherst	MIE 210	Statics		
	Boston	ENGIN 202	Statics		
	Dartmouth	EGR 241	Engineering Mechanics I - Statics	X	
	Lowell	ENGN 2050	Statics	X	
Strength of Materials	Amherst	CEE 241	Strength of Materials		
	Amherst	MIE 211	Strength of Materials		
	Boston	ENGIN 221	Strength of Materials		
	Dartmouth	CEN 202/212	Mechanics of Materials/Lab	X	
	Lowell	ENGN 2060	Strength of Materials	X	
Thermodynamics	Amherst	CEE 250	Thermodynamics		
	Boston	PHYS 214	Thermodynamics		
	Dartmouth	MNE 220	Engineering Thermodynamics	X	
	Lowell	MECH 2420	Thermodynamics	X	
Materials Science	Amherst	ENG 201	Introduction to Materials Science	X	
	Boston				
	Dartmouth	MNE 231	Material Science	Will need to get back to Elena	
	Lowell	MECH 2960	Materials Science for Engineers	X	
Engineering Design	Amherst			Will need to get back to Elena	
	Boston			Will need to get back to Elena	
	Dartmouth			Will need to get back to Elena	
	Lowell			Will need to get back to Elena	

16. Elena adjourned the meeting at 2:33 p.m.