

UNIVERSITY OF ILLINOIS
AT URBANA - CHAMPAIGN

EP.11.06

Office of the Provost and Vice Chancellor
for Academic Affairs

Swanlund Administration Building
601 East John Street
Champaign, IL 61820



September 13, 2010

Abbas Aminmansour, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Aminmansour:

Enclosed is a copy of a proposal from the College of Engineering to establish the Customized Concentration in the B.S. in Materials Science in Engineering.

This proposal has been approved by the College of Engineering Executive Committee. It now requires Senate review.

Sincerely,

Kristi A. Kuntz
Assistant Provost

KAK/njh

Enclosures

c: I. Adesida
D. Cahill
R. Dennis
P. Geil
S. Kamin
M. Pleck
C. Tucker

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering
Executive Committee
306 Engineering Hall, MC-266
1308 West Green Street
Urbana, IL 61801



September 7, 2010

Kristi Kuntz
Assistant Provost
217 Swanlund Administration Building
MC-304

Via: Ilesanmi Adesida, Engineering College

A handwritten signature in black ink, appearing to read 'Ilesanmi Adesida'.

Dear Ms. Kuntz:

The College of Engineering Executive Committee has reviewed and approved the following:

Establishment of a Customized Concentration in the B. S. in Materials Science and
Engineering in the College of Engineering

Attached is a copy of the request.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Brent J. Heuser'.

Brent J. Heuser, Secretary
Executive Committee

Approval Recommended:

A handwritten signature in black ink, appearing to read 'Ilesanmi Adesida'.

Ilesanmi Adesida, Dean
College of Engineering

Date

9/7/10

BJH/bro
Enclosure

c: David Cahill
Chuck Tucker
Phillip H. Geil
Sam Kamin
Michael Pleck
Robin Dennis

Proposal to the Senate Educational Policy Committee

PROPOSAL TITLE: Establishment of a Customized Concentration in the B. S. in Materials Science and Engineering in the College of Engineering

SPONSOR: Phillip H. Geil, Professor (Emeritus) of Materials Science and Engineering, 333-0149, geil@illinois.edu

COLLEGE CONTACT: Charles L. Tucker, III, Associate Dean for Undergraduate Programs, 333-2280, ctucker@illinois.edu

BRIEF DESCRIPTION: To complement the five standard Banner Concentrations in MatSE, we propose to add a “customized” concentration permitting a student, with departmental approval, to devise a Concentration in a nonstandard area. The requirements for the Customized Concentration consist of a total of 24 credit hours: 15 of appropriate “area specialty courses;” 3 credit hours from a different specialty area; and 6 hours of electives selected from the [list of approved technical electives](#) established by the department. In the 15 hours of “area specialty courses” there must be a course identified for each of the areas of processing, design, and characterization.

JUSTIFICATION: With the introduction of Banner, formal Concentrations were established in various campus undergraduate programs. Pre-Banner course groupings that merited recognition existed under various nomenclature such as concentrations, tracks, application areas, specialization areas, etc. While records can’t be found to indicate how they were approved, only some of these became official Banner Concentrations. For MatSE, five ‘areas of specialization’ (cf. <http://www.senate.illinois.edu/ep0216.pdf>) became officially recognized Banner Concentrations: Biomaterials, Ceramics, Electronic Materials, Metals, and Polymers.

However, from the beginning of the MatSE program, a parallel opportunity existed for a student to devise a customized or optional application area, the requirements for which were explicitly defined and equivalent to those for the standard ‘application areas’: i.e., 24 hrs of courses as described under Brief Description. Examples include composites, bio-based materials, and materials for renewable energy or sustainability. Although this option remains stated in the current POS, the MatSE customized ‘application area’ did not, for whatever reason, get approved as a Banner Concentration as the five standard ones did. With a student desiring such a concentration at present, this was brought to our attention. Accordingly, this proposal seeks to have the customized concentration gain the status attained by the standard concentrations within MatSE.

BUDGETARY AND STAFF IMPLICATIONS:

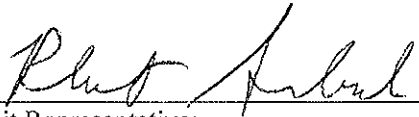
- a. Additional staff and dollars needed: None
- b. Internal reallocations (e.g., change in class size, teaching loads, student-faculty ratio, etc.): None
- c. Effect on course enrollment in other units and explanations of discussions with representatives of those departments: None
- d. Impact on the University Library: None
- e. Impact on computer use, laboratory use, equipment, etc.: None

DESIRED EFFECTIVE DATE: Fall, 2011

STATEMENT FOR PROGRAMS OF STUDY CATALOG: See Appendix

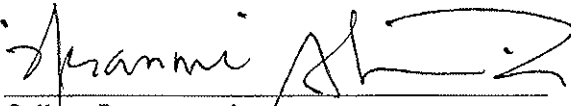
CLEARANCES:

Signatures:



Unit Representative:

4/29/10
Date:



College Representative:

9/7/10
Date:

Provost Representative:

Date:

Educational Policy Committee Representative:

Date:

APPENDIX

STATEMENT FOR PROGRAMS OF STUDY CATALOG

Changes to result from the proposed program revision are shown as Track Changes edits applied to the current 2009-10 version of the MatSE Undergraduate Programs of Study entry.

Materials Science and Engineering

mse.illinois.edu

Interim Head of Department: Robert S. Averback

Department Office: 201 Materials Science and Engineering Building, 1304 West Green, Urbana, (217) 333-1441

Curriculum in Materials Science and Engineering

mse.illinois.edu

Fax: (217) 333-2736

For the Degree of Bachelor of Science in Materials Science and Engineering

Materials science and engineering is the basis for all engineering. Improvements in the quality of life require knowledge of the processing and properties of current materials and the design, development and application of new materials. The Materials Science and Engineering (MatSE) curriculum provides an understanding of the underlying principles of synthesis and processing of materials and of the interrelationships between structure, properties, and processing. Students learn how to create advanced materials and systems required, e.g., for flexible electronic displays and photonics that will change communications technologies, for site specific drug delivery, for self-healing materials, for enabling the transition to a hydrogen-based economy, and for more efficient photovoltaics and nuclear systems for energy production. The curriculum uses concepts from both basic physics and chemistry and provides a detailed knowledge of what makes the materials we use every day behave as they do.

Students in the first two years take courses in general areas of science and engineering as well as courses introducing the concepts in MatSE. In the third year, students study the common, central issues related to MatSE. Seniors focus on application areas of MatSE (e.g., biomaterials, ceramics, metals, polymers, and electronic materials), which provide them with the detailed knowledge to be immediately useful to corporations or to provide an introduction to graduate study.

A combined B.S.-M.S. Materials Science and Engineering degree program is available. Its admission and course requirements are described in the [College of Engineering program information section](#).

Areas of Concentration

The MatSE program provides five standard areas of concentration as well as the option to design **unique programs a customized concentration** of interest to the student. Students are encouraged to take technical electives outside of the department in related disciplines of interest to them and of relevance to their career goals. **The five standard areas of concentration are:**

- **Biomaterials:** A relatively new focus area teaching the science and engineering of materials for use in biological applications, particularly in the human body. This concentration is based on basic and intermediate chemistry along with basic and intermediate biology concepts, with relatively less use of physics topics. This focus area includes a subset of the standard junior year courses and requires additional chemistry and biology in the junior year.
- **Ceramics:** Studies the science and engineering of ceramic materials, including alloy design, composites, synthesis, and processing methods. This concentration makes significant use of concepts from both basic physics and basic chemistry.
- **Electronic Materials:** Describes the design and engineering of materials primarily for the microelectronics industries. Topics span the ceramics, metals, and polymers areas. Concepts from basic and intermediate physics are used along with basic chemistry.
- **Metals:** Introduces the design and processing of metals and alloys to achieve desired properties. This concentration primarily uses concepts from basic and intermediate physics with relatively less emphasis on chemical concepts.
- **Polymers:** Teaches the methods for molecular design to achieve desired properties in polymer molecules and polymer blends as well as processing methods. This concentration primarily uses concepts from basic and intermediate chemistry with relatively less emphasis on physics concepts.

Overview of Curricular Requirements

The curriculum requires 131 hours for graduation and is organized as follows.

Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

Hours	Requirements
0	ENG 100—Engineering Orientation ¹
(1)	MSE 183—Freshman Materials Laboratory ^{1,2}
0	Total

1. External transfer students take ENG 300—Engrg Transfer Orientation instead.

2. This optional course is highly recommended and may be used to help meet free elective requirements.

Foundational Mathematics and Science

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

Hours	Requirements
3	CHEM 102—General Chemistry I
1	CHEM 103—General Chemistry Lab I
3	CHEM 104—General Chemistry II

1	CHEM 105—General Chemistry Lab II
4	MATH 221—Calculus I ¹
2	MATH 225—Introductory Matrix Theory
3	MATH 231—Calculus II
4	MATH 241—Calculus III
3	MATH 285—Intro Differential Equations
4	PHYS 211—University Physics: Mechanics
4	PHYS 212—University Physics: Elec & Mag
2	PHYS 214—Univ Physics: Quantum Physics
34	Total

1. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

Materials Science and Engineering Technical Core

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of materials science and engineering.

For All Concentrations

Hours	Requirements
3	CS 101—Intro Computing: Engrg & Sci
3	ECE 205—Elec & Electronic Circuits
3	IE 300—Analysis of Data
3	MSE 182—Introduction to MatSE
3	MSE 201—Phases and Phase Relations
4	MSE 206—Mechanics for MatSE
3	MSE 307—Materials Laboratory I
3	MSE 308—Materials Laboratory II
1	MSE 395—Materials Design
4	MSE 401—Thermodynamics of Materials
3	MSE 402—Kinetic Processes in Materials
3	MSE 406—Thermal-Mech Behavior of Matls
36	Subtotal for all concentrations. See additional technical core requirements

	below.
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For the Concentration in Biomaterials

Hours	Requirements
3	CHEM 232—Elementary Organic Chemistry I
4	MCB 150—Molec & Cellular Basis of Life
3	MCB 450—Introductory Biochemistry
3	MCB 252—Cells, Tissues & Development
13	Subtotal
49	Total for the Concentration in Biomaterials

For the Concentrations in Ceramics, Electronic Materials, Metals, and Polymers

Hours	Requirements
3	MSE 304—Electronic Properties of Matls
3	MSE 403—Synthesis of Materials or CHEM 232—Elementary Organic Chemistry I
3	MSE 405—Microstructure Determination
9	Subtotal
45	Total for the Concentrations in Ceramics, Electronic Materials, Metals, and Polymers

Technical Electives

These courses stress the rigorous analysis and design principles practiced in the major subdisciplines of materials science and engineering embodied in the MatSE concentrations.

For the Concentration in Biomaterials

Hours	Requirements
14	Area specialty courses selected from the list of area specialty courses established by the department.
6	Area specialty courses from a different area; both must be from the same area.
20	Total

For the Concentrations in Ceramics, Electronic Materials, Metals, and Polymers

Hours	Requirements
15	Area specialty courses selected from the list of area specialty courses established by the department.

3	Area specialty course from a different area.
6	Technical electives selected from the list of approved technical electives established by the department.
24	Total

Liberal Education

The liberal education courses, as approved by the College of Engineering, develop students' understanding of human culture and society, build skills of inquiry and critical thinking, and lay a foundation for civic engagement and lifelong learning.

Hours	Requirements
18	Liberal education electives approved by the College of Engineering and satisfying the campus general education requirements for (i) social and behavioral sciences, (ii) humanities and arts, and (iii) cultural studies, both western and non-western components..

Composition

These courses teach fundamentals of expository writing.

Hours	Requirements
4	RHET 105—Principles of Composition
	Advanced Composition (satisfied by completing the sequence MSE 307 and MSE 308 in the Materials Science and Engineering Technical Core)
4	Total

Free Electives

These unrestricted electives, subject to certain exceptions as noted at the [College of Engineering advising Web site](#), give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

Hours	Requirements
6	Free electives. Additional unrestricted course work, subject to certain exceptions as noted at the College of Engineering advising Web site , so that there are at least 131 credit hours earned toward the degree.

Area Specialty Courses

The courses listed below have been approved by the department to satisfy the 14-15 credit hour requirements in each of the five areas of technical concentration.

Hours	Biomaterials Concentration
3	MSE 470—Design and Use of Biomaterials

3	MSE 472—Biomaterials Laboratory
3	MSE 473—Biomolecular Materials Science
5	Two area technical electives ¹

Hours	Ceramics Concentration
3	MSE 420—Ceramic Materials & Properties
3	MSE 421—Ceramic Processing
3	MSE 422—Electrical Ceramics
3	MSE 423—Ceramic Processing Laboratory
3	Area technical elective ¹

Hours	Electronic Materials Concentration
3	ECE 440—Solid State Electronic Devices
3	MSE 460—Electronic Materials I
3	MSE 461—Electronic Materials II
3	MSE 462—Electronic Materials Lab
3	Area technical elective ¹

Hours	Metals Concentration
3	MSE 440—Mechanical Behavior of Metals
3	MSE 441—Metals Processing
3	MSE 442—Metals Laboratory
3	MSE 443—Design of Engineering Alloys
3	Area technical elective ¹

Hours	Polymers Concentration
3	MSE 450—Polymer Science & Engineering
3	MSE 452—Polymer Laboratory

3	MSE 453—Plastics Engineering
6	Two area technical electives ¹

1. Selected from the departmental [list of approved area technical electives](#) for areas of concentration.

Summary of Topics Courses for **Standard** Areas of Concentration

Each area of concentration requires at least one course covering each of the topics processing, design, and characterization (senior lab). For the five standard areas of concentration in the MatSE curriculum outlined above, the relevant courses are categorized in the following table.

Area of Concentration	Processing	Design	Characterization (Senior Lab)
Biomaterials	MSE 470*	MSE 470*	MSE 472
Ceramics	MSE 421	MSE 422	MSE 423
Electronic Materials	MSE 460	MSE 461	MSE 462
Metals	MSE 441	MSE 443	MSE 442
Polymers	MSE 453*	MSE 453*	MSE 452

* same course counts as both topics

Customized Concentration

Students wishing to pursue an area of concentration other than the ones described above should consult with the chief advisor of the MatSE department. A Customized Concentration (e.g., composites, bio-based materials, materials for renewable energy or sustainability, etc) must include a total of 24 credit hours: 15 of appropriate “area specialty courses;” 3 credit hours from a different specialty area; and 6 hours of electives selected from the list of approved technical electives established by the department. In the 15 hours of “area specialty courses” there must be a course identified for each of the topic categories in the table immediately above. The other courses may be suitable electives pertaining to the area of study. Customized Concentrations require the approval of the department and will be identified only as Customized Concentration on the transcript.

Suggested Sequence

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken. The first two years of the Suggested Sequence is the same for all MatSE students. The third and fourth years vary with the Area of Concentration chosen. Refer to the appropriate third and fourth year sequence.

First year

Hours	First Semester
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3	CHEM 102—General Chemistry I
1	CHEM 103—General Chemistry Lab I
0	ENG 100—Engineering Orientation
4	MATH 221—Calculus I ¹
3	MSE 182—Intro to Materials Sci and Eng
4-3	RHET 105—Principles of Composition ² or Liberal education elective ³
15-14	Total

Hours	Second Semester
3	CHEM 104—General Chemistry II
1	CHEM 105—General Chemistry Lab II
2	MATH 225—Introductory Matrix Theory
3	MATH 231—Calculus II
(1)	MSE 183—Freshman Materials Laboratory ⁴
4	PHYS 211—University Physics: Mechanics
3-4	Liberal education elective ³ or RHET 105—Principles of Composition ²
16-17	Total

Second year

Hours	First Semester
3	CS 101—Intro Computing: Engrg & Sci
4	MATH 241—Calculus III
3	MSE 201—Phases and Phase Relations
4	PHYS 212—University Physics: Elec & Mag
3	Liberal education elective ³
17	Total

Hours	Second Semester
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3	ECE 205—Elec & Electronic Circuits
3	MATH 285—Intro Differential Equations
4	MSE 206—Mechanics for MatSE
2	PHYS 214—Univ Physics: Quantum Physics
3	Liberal education elective ³
15	Total

Concentrations in Ceramics, Electronic Materials, Metals, and Polymers

Third year

Hours	First Semester
3	IE 300—Analysis of Data
3	MSE 307—Materials Laboratory I ⁵
4	MSE 401—Thermodynamics of Materials
3	MSE 406—Thermal-Mech Behavior of Matls
3	Liberal education elective ³
16	Total

Hours	Second Semester
3	MSE 304—Electronic Properties of Matls
3	MSE 308—Materials Laboratory II ⁵
3	MSE 402—Kinetic Processes in Materials
3	MSE 405—Microstructure Determination
3	Area specialty course ⁶
3	Free Elective
18	Total

Fourth year⁷

Hours	First Semester
3	MSE 403—Synthesis of Materials or CHEM 232—Elementary Organic Chemistry I
6	Area specialty courses ⁶

3	Area specialty course in a different area ⁶
3	Technical elective ⁸
3	Liberal education elective ³
18	Total

Hours	Second Semester
1	MSE 395—Materials Design
6	Area specialty courses ⁶
3	Technical elective ⁸
3	Liberal education elective ³
3	Free elective
16	Total

Concentration in Biomaterials

Third Year

Hours	First Semester
3	CHEM 232—Elementary Organic Chemistry I
3	IE 300—Analysis of Data
3	MSE 307—Materials Laboratory I ⁵
4	MSE 401—Thermodynamics of Materials
3	MSE 406—Thermal-Mech Behavior of Matls
16	Total

Hours	Second Semester
4	MCB 150—Molec & Cellular Basis of Life
3	MCB 450—Introductory Biochemistry
3	MSE 308—Materials Laboratory II ⁵
3	MSE 402—Kinetic Processes in Materials
3	Liberal education elective ³

16	Total
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Fourth year²

Hours	First Semester
9	Area specialty courses ⁶
3	Area specialty course in a different area ^{6,9}
3	Liberal education elective ³
3	Free Elective
18	Total

Hours	Second Semester
3	MCB 252—Cells, Tissues & Development
1	MSE 395—Materials Design
5	Area specialty courses ⁶
3	Area specialty course in a different area ^{6,9}
3	Liberal education elective ³
3	Free elective
18	Total

1. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.
2. RHET 105 may be taken in the first or second semester as authorized. The alternative is a social sciences or humanities elective.
3. Each student must satisfy the 18-hour liberal education requirements of the College of Engineering and the campus general education requirements for (i) social and behavioral sciences, (ii) humanities and arts, and (iii) cultural studies, both western and non-western components.
4. This course is highly recommended for freshmen, who may use it to help meet free elective requirements.
5. Satisfies the General Education Advanced Composition requirement.
6. To be selected from list of area specialty courses established by the department to provide an acceptable level of study in the student's chosen area of concentration.
7. Strongly recommended is incorporation of one or more of an internship, co-op position, and a research project during summers or an academic semester, or both. For students who intend to continue in graduate school, recommended additionally is the undertaking of a research project (Senior Thesis) in the senior year. The project may take the place of 4-6 hours of free, technical,

or area specialty electives.

8. Selected from the departmental list of approved technical electives.

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering
Executive Committee
306 Engineering Hall, MC-266
1308 West Green Street
Urbana, IL 61801



Approved Minutes
College of Engineering Executive Committee (EC) Meeting
Tuesday, 1:00 p.m., August 24, 2010
301 Engineering Hall

Present:

D. Abrams (CEE)	J. Freund (MechSE)	D. Pack (ChBE)
I. Adesida (Admin)	D. Ceperley (Phys)	H. Reis (IESE)
S.-L. Chuang (MNTL)	B. Heuser (NPRES)	C. Tucker (Admin)
B. Conway (AE)	D. Jones (ECE)	J. Weaver (MatSE)
V. Coverstone (Admin)	P. Kalita (ABE)	M. Wong (CSL)
B. Cunningham (BioE)	S. Kamin (CS)	

Absent

* = alternate, ** = guest

The meeting was called to order at 1:00 pm.

1. Opening remarks.

Dean Adesida: The Dean welcomed all members, stressing importance of the work of the committee. The Dean briefly discussed communication channels between the COE EC and the COE faculty body. He also discussed incoming freshman numbers (1484 students), plus ~165 in ChBE and ~130 transfer students. In addition, the COE has ~32% out-of-state students (12% US and 20% international). The Dean discussed the COE surcharge as well. All of these topics will be on the table during the upcoming retreat. The Dean also discussed an upcoming scholarship program to be implemented over the next two years. The undergraduate study climate, education, and other key aspects of undergraduate education were mentioned as critical to the overall long-term health of the University and COE in particular. The faculty leadership program introduced during the last academic year was stressed as being important to the COE. The Dean also mentioned the COE Bylaws modification as an outstanding issue for the COE EC.

2. Approval of the draft minutes, May 4, 2010.

The minutes were approved unanimously.

3. Introduction of new members.

All members introduced themselves.

4. Meeting schedule for 2010-2011.

The EC meeting schedule was presented.

5. New/Old Business

5a. Appointment of COE Grievance Committee

Grievance Committee Members for 2010-2011:

D. Jones (ECE), P. Kalita (ABE), B. Conway (AE), D. Ceperley (Physics), and J. Freund (MechSE).

The selection of the chair of this committee will occur outside of the current EC meeting and will be announced in an upcoming EC meeting.

5b. Appointment of the 2010-2011 P&T Committee Member(s) from the COE EC

P&T Committee members from the COE EC:

J. Weaver (MatSE) and B. Conway (AE)

These members were elected by a secret vote. B. Conway was unanimously elected (two abstentions) as chair.

In addition, the following faculty are members of the 2010-2011 P&T Committee: P. Ferreira (MechSE), C. Dutton (AE), E. Rosenbaum (ECE), T. Liss (Physics).

5c. Designation of new representative for the campus General Education Board:

A. Rockett (MatSE) was elected unanimously.

6. Old Business.

6a. Appointment of new subcommittee chair for ECE 565 "Hot Chips: Atoms to Heat Sinks"

The following faculty members now comprise this subcommittee: W. King (MechSE) chair, K. Jain (ECE), and P. Phillips (Physics).

7. Course and program proposals/reports

7a. New/Revised Course Outlines and Program Proposals; subcommittees and/or actions as follows:

ABE 341: P. Kenis (ChBE) chair, R. Gates (ABE), Q. Brewster (MechSE).

This committee should take a careful examination of the syllabus for the proposed course with regard to the lack of discipline specific information. This examination should be done within the context of duplication and redundancy of other courses on campus that teach similar concepts.

CEE 444:

Motion to approve revision was approved with one vote against and three abstentions.

ECE 574: H. Johnson (MechSE), J. Rogers (MatSE) chair, G. Eden (ECE).

This committee should consider any overlap with other photonics courses taught on campus, such as in the Physics Department.

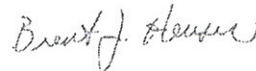
ENG 315 and 333: M. Loui (ECE) chair, L. Pitt (CS), M. Philpot (MechSE).

Committee should attempt to gain additional syllabus information regarding course content from the course instructor for both courses. In addition, the grading schemes and narrative text regarding the philosophy of these courses would be useful for the COE EC's consideration of this proposal.

MatSE Custom Concentration Proposal: Motion to approve this proposal passed unanimously.

The meeting adjourned at 2:30.

Respectfully submitted,



Brent J. Heuser, Secretary

cc: Robin Dennis
Becky Osgood
Michael Pleck