UNIVERSITY OF NEBRASKA BOARD OF REGENTS
BOARD OF REGENTS MEETING ITINERARY

FRIDAY, APRIL 13, 2012

8:00 a.m. — BUSINESS AFFAIRS COMMITTEE

Topic: Legislative Wrap-up *[10 minutes]*
Presenter: Ron Withem, Senior Associate Vice President and Director of Governmental Relations

Strategic Framework Reports *[20 minutes]*
Topics: Faculty Merit Compensation [2-a-i]; Human Resources [6-c-ii]
Presenter: Chris Kabourek, Assistant Vice President for Business and Finance and Director of Budget

Topic: University Budget Planning *[30 minutes]*
Presenter: Chris Kabourek, Assistant Vice President for Business and Finance and Director of Budget

Topic: UNK Facilities Plan Update *[30 minutes]*
Presenter: Chancellor Doug Kristensen, University of Nebraska at Kearney
Lee McQueen, Director of Facilities Management and Planning, University of Nebraska at Kearney

9:30 a.m. — BREAK

9:45 a.m. — ACADEMIC AFFAIRS COMMITTEE

Strategic Framework Reports
Topic: a. Student Learning Assessment- Licensure Exams [6-g] *[15 minutes]*
Presenters: The Academic Affairs Committee ~
Regents Schroeder, Ferlic, Hassebrook, and Whitehouse

Topic: b. Distance Education [1-g-i] *[30 minutes]*
Presenter: Mary Niemiec, Associate Vice President for Distance Education and Director of Online Worldwide

Topic: Ph.D. in Engineering – Department-based Ph.D. degrees *[30 minutes]*
Presenters: Chancellor Harvey Perlman, University of Nebraska-Lincoln
Tim Wei, Dean, College of Engineering, University of Nebraska-Lincoln

Topic: UNL Differential Tuition Proposal – College of Architecture *[15 minutes]*
Presenter: Chancellor Harvey Perlman, University of Nebraska-Lincoln
James O'Hanlon, Interim Dean, College of Architecture, University of Nebraska-Lincoln

11:30 a.m. — BOARD OF REGENTS MEETING

- Kudos Awards Presented

AGENDA - REVISED
THE BOARD OF REGENTS
OF THE UNIVERSITY OF NEBRASKA
Varner Hall, 3835 Holdrege Street
Lincoln, Nebraska 68583
Friday, April 13, 2012
11:30 a.m.

I. CALL TO ORDER

II. ROLL CALL

III. APPROVAL OF MINUTES AND RATIFICATION OF ACTIONS TAKEN ON MARCH 2, 2012

IV. KUDOS

Craig Adler, University of Nebraska at Omaha
Joel Brehm, University of Nebraska-Lincoln
Don R. Wellensiek, University of Nebraska at Kearney
Gary L. Beck, University of Nebraska Medical Center

V. RESOLUTIONS

VI. HEARINGS

VII. PUBLIC COMMENT

The Standing Rules of the Board provide that any person who gives 24 hours notice to the Corporation Secretary of the Board may speak to any item that is not on the agenda. In addition, any person may appear and address the Board of Regents on any item on the agenda for this meeting. Each person will be given up to five minutes to make his or her remarks. Public comment will be limited to a period of 30 minutes.

VIII. UNIVERSITY ADMINISTRATIVE AGENDA
- A. ACADEMIC AFFAIRS
  1. Disaggregation of seven department-based tracks of the unified Ph.D. in Engineering at the University of Nebraska-Lincoln into stand-alone Ph.D. degree programs: Architectural Engineering; Biological Engineering; Chemical and Biomolecular Engineering; Civil Engineering; Computer Engineering; Electrical Engineering; and Mechanical Engineering and Applied Mechanics Addendum VIII-A-1
  2. Approval is requested to establish a Master of Science in Emergency Preparedness under the sponsorship of the University of Nebraska Medical Center Addendum VIII-A-2
  3. Approval is requested to create a Master of Science in Information Assurance at the University of Nebraska at Omaha Addendum VIII-A-3

B. BUSINESS AFFAIRS

University of Nebraska

1. Approve the acceptance of the single audit of the University of Nebraska Addendum VIII-B-1

University of Nebraska-Lincoln

2. Approve the revised legal description for the Exchange Agreement between the Board of Regents, the City of Lincoln and the Nebraska Innovation Campus Development Corporation and allow the General Counsel in consultation with the President and Chair to approve the final legal description Addendum VIII-B-2
3. Approve the Program Statement and Budget for Whittier Research Center Renovation – Phase II at the University of Nebraska-Lincoln Addendum VIII-B-3
4. Approve the Renovation of Undergraduate Labs in Hamilton Hall, Second Floor North Wing Addendum VIII-B-4
5. Approve the sole source purchase of Ion Beam Etching System for the University of Nebraska-Lincoln Addendum VIII-B-5
6. Approve the Fund B University Program and Facilities Fees 2012-13 Allocation for the University of Nebraska-Lincoln Addendum VIII-B-6

University of Nebraska at Kearney

7. Approve the Fund B, University Program and Facilities Fee 2012-13 Allocation for the University of Nebraska at Kearney Addendum VIII-B-7

University of Nebraska Medical Center

8. Approve the Fund B, University Program and Facilities Fee 2012-13 Allocation for the University of Nebraska Medical Center Addendum VIII-B-8

University of Nebraska at Omaha

9. Approve the Fund B, University Program and Facilities Fees 2012-13 Allocation for the University of Nebraska at Omaha Addendum VIII-B-9

Additional Item – University of Nebraska at Omaha

10. Approve a five-year agreement between the University of Nebraska at Omaha and Nelligan Sports Marketing, subject to final approval of the UNO Chancellor and the Board Chair Addendum VIII-B-10

C. FOR INFORMATION ONLY

1. University of Nebraska Strategic Planning Framework Addendum VIII-C-1
2. University of Nebraska Strategic Framework Accountability Measures Addendum VIII-C-2
3. Calendar of establishing and reporting accountability measures Addendum VIII-C-3
4. University of Nebraska Strategic Dashboard Indicators Addendum VIII-C-4
5. Board of Regents agenda items related to the University of Nebraska Strategic Framework Addendum VIII-C-5

D. REPORTS

1. Laboratory, Student, and Miscellaneous Fees for 2012-2013 Addendum VIII-D-1
2. Strategic Framework report on Entrepreneurship [3-d] Addendum VIII-D-2
3. Renaming the Bachelor of Arts (BA) and Bachelor of Science (BS) majors, and BA and BS minors in International Studies to the Bachelor of Arts (BA) and Bachelor of Science (BS) majors, and BA and BS minors in Global Studies at the University of Nebraska-Lincoln Addendum VIII-D-3
4. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Digital Humanities Addendum VIII-D-4
5. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Intellectual, Sensory and Developmental Disabilities Addendum VIII-D-5

6. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Transdisciplinary Childhood Obesity Prevention Addendum VIII-D-6
7. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Financial and Housing Counseling in the Department of Child, Youth, and Family Studies Addendum VIII-D-7
8. Report of the Members of the University of Nebraska Project Review Board Pool Addendum VIII-D-8
9. UNL Outdoor Adventures Center Intermediate Design Report Addendum VIII-D-9
10. UNK Master Plan 5-Year Update Addendum VIII-D-10
11. Bids and Contracts Report Addendum VIII-D-11

Additional Item

12. Strategic Framework report on Licensure [6-g] Addendum VIII-D-12

IX. ADDITIONAL BUSINESS

VIII. UNIVERSITY ADMINISTRATIVE AGENDA

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TO:	The Board of Regents	Addendum VIII-A-1
	Academic Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Disaggregation of seven department-based tracks of the unified Ph.D. in Engineering at the University of Nebraska-Lincoln (UNL) into stand-alone Ph.D. degree programs: Architectural Engineering; Biological Engineering; Chemical and Biomolecular Engineering; Civil Engineering; Computer Engineering; Electrical Engineering; and Mechanical Engineering and Applied Mechanics	
RECOMMENDED ACTION:	Approval is requested to disaggregate seven department-based tracks of the unified Ph.D. in Engineering at UNL into stand-alone Ph.D. degree programs: Architectural Engineering; Biological Engineering; Chemical and Biomolecular Engineering; Civil Engineering; Computer Engineering; Electrical Engineering; and Mechanical Engineering and Applied Mechanics programs	
PREVIOUS ACTION:	May 18, 1973 – The Board approved initiating a unified interdepartmental Ph.D. program in Engineering	
EXPLANATION:	Since 1973 when the unified Ph.D. in Engineering was approved, the graduate tracks have developed in faculty, curriculum, and student demand. The seven programs identified have established strong records of recruiting and graduating Ph.D. candidates and have extensive research programs that will support doctoral students. The graduate programs in these departments have been regularly reviewed as part of UNL's program review process and the Accreditation Board for Engineering and Technology (ABET) accreditation process. All areas have the faculty and resources to provide high quality doctoral programs. The stand-alone programs will promote better visibility and better meet the career needs of prospective students. The move into the Big Ten makes this change even more appropriate as engineering colleges within the other institutions have department-based doctoral programs. The existing doctoral major in Engineering with specializations will remain. This proposal has been endorsed by the UNL Graduate Council, the NU Council of Academic Officers, and the NU Executive Graduate Council. A summary of the program description follows this agenda item. Detailed information, including the budget tables, is posted at the website (http://www.nebraska.edu/board/agendas-and-minutes.html) and is incorporated in its entirety into this agenda item by reference.	
PROJECT COST:	The programs and faculty needed to continue the programs are currently in existence and thus no new cost is anticipated.	
SOURCE OF FUNDS:	Not applicable	

SPONSORS:	Ellen Weissinger Senior Vice Chancellor for Academic Affairs
	Harvey Perlman, Chancellor University of Nebraska-Lincoln
RECOMMENDED:	Linda R. Pratt Executive Vice President and Provost Dean of the Graduate College
DATE:	March 26, 2012

Proposal for Department-based PhD programs in the College of Engineering

I. Descriptive Information

A. Name of the Institution Proposing the Program: University of Nebraska-Lincoln

B. Name of the Program: The College of Engineering proposes to separate seven department-based Doctor of Philosophy degree programs from the unified PhD program in the College of Engineering to stand-alone doctoral degrees in the following areas:

1) Architectural Engineering (Durham School)
2) Biological Engineering (Department of Biological Systems Engineering)
3) Chemical and Biomolecular Engineering (Department of Chemical and Biomolecular Engineering)
4) Civil Engineering (Department of Civil Engineering)
5) Computer Engineering (Department of Computer Science and Engineering)
6) Electrical Engineering (Department of Electrical Engineering)
7) Mechanical Engineering and Applied Mechanics (Department of Mechanical and Materials Engineering)

C. Degrees/Credentials to be awarded graduates of this institution: Doctor of Philosophy in the seven areas.

D. Other programs offered in this field by this institution: MS, MEng, PhD

E. CIP Codes: (Corresponding with Item B above)

1) 14.0401
2) 14.4501
3) 14.0702
4) 14.0801
5) 14.0901
6) 14.1001
7) 14.1901

F. Administrative units for this program: College of Engineering

G. Proposed delivery site(s) and type(s) of delivery, if applicable: The College of Engineering is located in Lincoln and Omaha and the programs will be offered at both sites.

H. Date approved by governing board:

I. Proposed Date of Initiation: Fall 2012

EXECUTIVE SUMMARY

The unified PhD program currently in the College of Engineering was established in 1973. At that time the College had doctoral programs in Mechanical Engineering, Engineering Mechanics, Electrical Engineering, and Chemical Engineering and approval was being sought for a program in Civil Engineering. When the unified PhD was established, these doctoral five programs were designated Fields of Study, and were placed under that umbrella. In 1973 the College's research and graduate programs were not as well established as today. The unified PhD Engineering program provided an avenue to develop graduate programs within the various areas of the College as the College developed.

Today the College's research and graduate program is well established, generating approximately $30 million of external research funding annually. Similarly, the graduate program has grown; 249 doctoral students are presently enrolled in the unified PhD program and 149 doctoral degrees were awarded in the last 5 years (2007-2011).

The seven programs that seek a separate PhD are Biological Engineering, Chemical & Biomolecular Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, and Mechanical Engineering and Applied Mechanics. They have established strong track records in recruiting and graduating PhD students with extensive research activities underway to support doctoral students. These programs have also demonstrated that they have the faculty and other resources necessary to offer high quality doctoral education.

Establishing these stand-alone, department-based programs will promote greater visibility, resulting in more effective recruitment of prospective graduate students and faculty, as well as placement of PhD graduates. With a stand-alone, department-based program, faculty will be able to focus more specifically on student needs and the needs of organizations that hire their doctoral graduates. It also is an appropriate step with the movement of UNL into the Big Ten Conference where engineering colleges operate only department-based doctoral programs.

Therefore, this request will allow the College of Engineering to organize its PhD programs in ways that will promote their growth and strength. The existing doctoral major in Engineering with specializations in Biomedical Engineering, Computer Engineering, Construction, Industrial and Management Systems Engineering and Materials Engineering will remain.

Architectural Engineering. The Architectural Engineering Program started in 1998 because of a strong need of Nebraska architectural engineering design firms for graduates educated in this technical field. Today, the Architectural Engineering program is housed in the Durham School of Architectural Engineering and Construction and is one of two ABET-accredited programs granting a PhD in this area (the other is Pennsylvania State University). There are 17 ABET-accredited architectural engineering undergraduate programs and approximately 10,000 firms in the country that hire architectural engineering graduates, making competition for graduates and architectural engineering faculty intense. There are ten faculty within the Durham School of

Architectural Engineering and Construction associated with the Architectural Engineering Graduate Faculty. Since 2002, there have been 21 PhD graduates from Architectural Engineering through the unified PhD in the College of Engineering. At the present time there are 17 PhD students enrolled in the program.

Biological Engineering. The proposed PhD program in Biological Engineering provides educational and research experiences to students in: agricultural sensors and equipment testing, site specific crop management, bioenergy, biomedical engineering, environmental quality improvement, food and bioproducts engineering, and soil and water resources engineering, including irrigation engineering and ecosystems engineering. The USDA projects a 5% increase in the need for graduates with expertise in agricultural and food systems, renewable energy, and the environment. The Biological Engineering program also includes applications of engineering science to solve problems in human medicine. Employment growth for biomedical engineers is projected to grow much faster (72%) than the average for all other occupations (U S Dept. of Labor). The Biological Systems Engineering Department has 28 full-time faculty members. Since 2000, there have been 23 PhD graduates from Biological Engineering through the unified PhD in the College of Engineering with enrollment averaging 15 to 16 PhD students in the program.

Chemical & Biomolecular Engineering. The proposed PhD program in Chemical and Biomolecular Engineering prepares students with a foundation in chemical and biomolecular engineering sciences. In addition to the needs of Nebraska, chemical engineering is vital to the U S manufacturing sector and spans diverse fields that include the petroleum, mining, biomedical and materials industries. The recently-merged Department of Chemical & Biomolecular Engineering has 12 full-time faculty members. Between December 2001 and December 2010, there were 23 PhD graduates in the Chemical & Biomolecular Engineering field of study. Currently, there are 25 PhD students in the Chemical & Biomolecular Engineering field of study within the unified PhD in Engineering.

Civil Engineering. The skills and knowledge of civil engineers with PhDs include fundamental and advanced knowledge of infrastructure systems. Civil engineers plan, design, construct, maintain, and operate critical infrastructure (roads, bridges, railroads, water and wastewater treatments plants, sewers, dams, etc.), impacting economics, human health, food security and food safety. With increasing infrastructure problems across the country, the need for civil engineers with PhDs is essential to the state, the nation and the world. The Department of Civil Engineering has 25 graduate faculty associated with the proposed program. Between 2003 and 2011, there were 36 graduates of the Civil Engineering field of study within the unified PhD in Engineering. Currently, there are 43 students enrolled in the Civil Engineering field of study.

Computer Engineering. The current Computer Engineering field of study within the unified PhD in Engineering has been in place since 1978. The Department of Computer Science and Engineering has offered a standalone PhD program in Computer Science since 1984. Faculty

identified 24 Computer Science doctoral students over the past 5 years that would have been better trained and better served by earning the proposed PhD in Computer Engineering rather than the stand-alone Computer Science PhD. While the core of computer engineering relates to Computer Science and Electrical Engineering, today, cyber-physical systems, featuring a combination of, and coordination between their computational and physical elements, are found in aerospace, automotive and chemical industries. To address these needs, students in the proposed Computer Engineering program study in one of three tracks: circuits and cyber-physical interface, systems, and communications, networking, and signal processing. Twenty-two faculty from the departments of Computer Science and Engineering and Electrical Engineering are associated with the proposed program. Since 2008, two students have earned PhDs in the Computer Engineering field of study within the unified PhD in Engineering program. Currently, there are nine students enrolled in the field of study.

Electrical Engineering. The UNL Electrical Engineering Department's research expertise in solid state materials, optics, communications, signal processing, remote sensing, power, and very-large-scale integration (VLSI) design is reflected in the proposed Electrical Engineering program. Although the demand for electrical engineering is expected to increase modestly, students graduating from the UNL electrical engineering field of study are poised to contribute to and lead technology-driven industries. The Department of Electrical Engineering has 26 graduate faculty. Between 2003 and 2010, 42 students earned PhDs in the Electrical Engineering field of study within the unified PhD in Engineering program. Admissions over the last five years have ranged from 8 to 16 with an average of 13 students admitted.

Mechanical Engineering and Applied Mechanics. Mechanical Engineering and Applied Mechanics are considered sister fields and, therefore, are joined into a single degree program in most universities. The proposed program in Mechanical Engineering and Applied Mechanics includes specialties in thermal sciences, fluid mechanics, solid mechanics, systems, design and controls, dynamics and vibrations and computational methods. Fourteen Mechanical Engineering faculty and 11 Engineering Mechanics faculty offer the program. Between 2006 and 2010, 24 students graduated with Engineering Mechanics and Mechanical Engineering areas of study through the unified PhD in Engineering program.

Architectural Engineering PhD Program Proposal

Statement of Justification

The Architectural Engineering (AE) Ph.D. draws heavily from affiliated engineering and scientific disciplines. Yet, the AE Ph.D. expands beyond the fundamental and culminates in an understanding of the integration of complex built systems, and the contribution of each system component. AE Ph.D. students will accomplish their education through a combination of coursework, seminars, conducting research, and presenting and defending their research results. Within the architectural engineering field, Ph.D. students can concentrate on building energy, lighting, electrical, acoustics, and structures.

There are currently 17 ABET-accredited programs in Architectural Engineering (AE) in the United States, as listed in Table 1. Only one of these other institutions currently grants a PhD in AE: Pennsylvania State University. Students who study the building sciences to the PhD level at other universities typically receive their degree in an affiliated department (e.g. Civil Engineering, Mechanical Engineering, etc.), possibly from an AE program field. The University of Nebraska-Lincoln currently offers a PhD in Architectural Engineering but it is under the College of Engineering's Unified PhD program. This proposed PhD in Architectural Engineering within the Durham School of Architectural Engineering and Construction will allow UNL to become a recognized university for students seeking graduate studies in this field and enhance our signature program within the Big Ten conference and nationwide.

Table 1. ABET-Accredited AE Programs in U.S. Universities

1.	California Polytechnic State University
2.	Drexel University
3.	Illinois Institute of Technology
4.	Kansas State University
5.	Milwaukee School of Engineering
6.	Missouri University of Science and Technology (formerly the University of Missouri–Rolla)
7.	North Carolina Agricultural and Technical State University
8.	Oklahoma State University
9.	Pennsylvania State University
10.	Tennessee State University
11.	University of Colorado at Boulder
12.	University of Kansas
13.	University of Miami
14.	University of Nebraska–Lincoln
15.	The University of Oklahoma
16.	University of Texas at Austin
17.	University of Wyoming

The Architectural Engineering Program at UNL started in 1998 because of the strong need of Nebraska architectural engineering design firms for graduates educated in this technical field. They have traditionally recruited architectural engineering graduates from Penn State University,

Kansas State University, and a few from the University of Kansas. The competition for the graduates of these programs is fierce. There are approximately 10,000 firms in the country that hire architectural engineering graduates when possible, and only a few hundred graduates matriculating each year. Furthermore, the construction industry is one of the largest in the country (about $600 billion in sales per year, and seven million employees). The Architectural Engineering Program at the University of Nebraska was set up to satisfy this need of the Nebraska firms. However, this program will also be able to satisfy the needs of other institutions for PhD graduates to conduct research and teach sustainable systems to the next generation.

Architectural engineering consistently ranks in the top ten engineering disciplines that students indicate they plan to study in college. Table 2a shows the ranking achieved by AE out of the engineering disciplines that students could select from 1997-2001. Architectural engineering was selected by fewer students than computer, chemical and mechanical engineering, tied with civil and biological engineering (i.e., switches ranking with these disciplines, depending on year), and was consistently preferred by students over industrial engineering and engineering management. Architectural engineering is thus a popular option with students. Table 2b shows the results from 2004-2010.

Table 2a. Top Ten Engineering Disciplines as Selected by Students Taking ACT (1997-2001)

	Rank Order By Year				
Discipline	**2001**	**2000**	**1999**	**1998**	**1997**
Computer	1	1	1	1	3
Mechanical	2	2	2	3	2
Aerospace	3	3	4	4	4
Electrical/Electronic	4	4	3	2	1
Chemical	5	5	5	5	5
Civil	6	6	7	6	6
Biological	7	8	8	8	8
Architectural	8	7	6	7	7
Construction	9	9	9	9	9
Industrial	10	10	10	10	11

Table 2b. Top Ten Engineering Disciplines as Selected by Students Taking ACT (2004-2010)

	Rank Order By Year						
Discipline	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
Mechanical	1	1	1	1	1	1	1
Aerospace	2	2	2	2	2	2	2
Civil	3	3	3	5	5	5	5
Chemical	4	4	4	6	6	6	6
Electrical/Electronics	5	5	5	4	4	4	4
Computer	6	6	6	3	3	3	3
Bioengineering & Biomedical	7	7	7	7	7	7	7
Architectural & Biosystems	8	8	9	9	9	9	9
Construction Engineering/Management	9	9	8	8	8	8	8
Industrial	10	10	10	10	11	11	11

Table 3 shows the number ABET of accredited engineering programs that serve these disciplines. With only 17 ABET accredited AE programs, one of the popular engineering options identified by students about to embark on their undergraduate careers is not being adequately served by US universities. There is a clear need and opportunity for the development of more Architectural Engineering programs in the U.S., both at the undergraduate and graduate levels. Our PhD graduates in AE will fill the anticipated future need.

Table 3. Number of ABET Accredited Engineering Programs in the U.S. in Each Discipline

Discipline	Number of Programs
Electrical/Electronic	289
Mechanical	279
Civil	219
Computer	211
Chemical	155
Industrial	94
Aerospace	66
Architectural	17
Biological	11
Construction	11

Other demographic statistics support this conclusion. Table 4a shows the number of surveyed individuals working in science and engineering during the 1990s, who indicate that their degrees are in specific engineering fields (ASEE: http://www.asee.org/papers-and-publications/publications/college-profiles). Although Architectural Engineering is consistently selected by students taking the ACT standardized test as one of the top ten engineering disciplines, the number of respondents holding a Bachelor's degree in Architectural Engineering exceeds only the number of individuals holding Bachelor's degrees in Bioengineering or Biomedical. Furthermore, although the number of individuals surveyed holding Bachelor's degrees in Bioengineering/Biomedical was ranked last, these disciplines showed the highest growth rate over the time period surveyed (increasing 37.25%), whereas Architectural Engineering actually showed the largest decrease in the number of individuals holding Bachelor's degrees over the time period surveyed (14.69 % fewer in 1999 than in 1993).

Table 4b shows more recent data on the number of degrees awarded in specific engineering fields from 2000-2006, as collected by the National Science Foundation (NSF) under the auspices of the Scientists and Engineers Statistical Data System (SESTAT). NSF SESTAT databases contain demographic information from representative samples of people living in the U.S. who are employed as scientists or engineers (complete details on the NSF SESTAT databases are available online at http://www.nsf.gov/statistics/us-workforce/).

Similar trends are apparent in the numbers regarding all degree levels (Bachelor's, Master's and Doctorate combined). These data compiled in the 1990s are presented in Table 5a. Once again, although the number of individuals holding any Architectural Engineering degree was higher than those holding Bioengineering/Biomedical degrees, the growth rate in those holding

any Bioengineering/ Biomedical degree was highest over the time period surveyed (increasing nearly 40%), whereas Architectural Engineering showed the largest decrease over all disciplines in the number of individuals holding any degree over the time period surveyed (nearly 14% fewer in 1999 than in 1993). Table 5b shows more recent data on the number of degrees awarded in specific engineering fields from 2000-2006.[1]

Table 4a. Number of Individuals Holding Degrees in Specific Engineering Fields (ASEE)

Highest Degree: Bachelor's						
Discipline	**1993**	**1995**	**1997**	**1999**	**Difference**	**% Difference**
Mechanical	374,100	377,400	381,700	375,500	1,400	0.37
Aerospace	73,700	71,000	69,000	64,400	-9,300	-12.62
Civil	241,300	247,500	255,700	258,200	16,900	7.00
Chemical	127,500	130,500	128,100	138,500	11,000	8.63
Electrical/Electronic	447,800	451,800	459,400	455,200	7,400	1.65
Computer	406,600	423,500	447,200	481,000	74,400	18.30
Bioengineering/Biomedical	5,100	6,500	6,600	7,000	1,900	37.25
Architectural	42,200	39,700	37,800	36,000	-6,200	-14.69
Industrial	102,800	103,800	101,700	100,500	-2,300	-2.24

Table 4b. Number of Individuals Holding Degrees in Specific Engineering Fields (NSF)

Highest Degree: Bachelor's							
Discipline	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Mechanical	12,992	12,921	13,247	13,801	14,182	14,947	16,063
Aerospace	1,296	1,558	1,711	2,011	2,232	2,371	2,722
Civil	8,653	8,027	8,066	8,192	8,142	8,247	8,935
Chemical	6,023	5,740	5,529	5,233	4,801	4,521	4,452
Electrical	11,211	11,096	11,402	11,994	12,500	12,459	11,915
Computer	3,972	4,519	4,720	5,746	5,838	5,455	4,901
Biological	583	549	556	603	601	635	646
Architectural	559	554	513	627	590	722	631
Industrial	3,555	3,474	3,575	3,769	3,790	3,647	3,664

Table 5a. Number of Individuals Holding Degrees in Specific Engineering Fields (ASEE)

All Degrees: Bachelor's, Master's, Doctorate						
Discipline	**1993**	**1995**	**1997**	**1999**	**Difference**	**% Difference**
Computer	570,100	602,400	642,900	692,200	122,100	21.42
Mechanical	454,500	461,400	468,800	469,300	14,800	3.26

[1] Data in Tables 4a and 5a give the number of degrees held by individuals, including all practicing, non-practicing, and new graduates who hold degrees in those fields for the given year. Data in Tables 4b and 5b give only the number of degrees newly awarded that year. The discrepancy between the 'a' (ASEE) and 'b' (NSF) tables is due to the method of data collection. ASEE receives their information about the number of degrees from purely voluntary school participation, in which each school choosing to take part reports the number of graduates in each ABET accredited discipline they offer. The NSF receives information for Bachelor's and Master's degrees from a mandatory survey conducted by The National Center for Education Statistics. Schools must participate in this if they wish to take part in the federal financial assistance programs. The Doctoral degrees reported by NSF are from a voluntary survey, the Survey of Earned Doctorates (SED), which is funded jointly by six different entities.

Aerospace	100,800	99,100	95,500	91,900	-8,900	-8.83
Electrical/Electronic	593,800	605,300	625,000	630,000	36,200	6.10
Chemical	169,900	173,400	172,000	182,800	12,900	7.59
Civil	316,200	324,100	336,700	344,700	28,500	9.01
Bioengineering/Biomedical	10,800	13,400	14,100	15,100	4,300	39.81
Architectural	48,800	45,900	44,000	42,000	-6,800	-13.93
Industrial	126,900	129,800	130,600	129,900	3,000	2.36

Table 5b. Number of Individuals Holding Degrees in Specific Engineering Fields (NSF)

All Degrees: Bachelor's, Master's, Doctorate							
Discipline	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Mechanical	17,229	17,373	17,609	18,273	19,498	20,678	21,826
Aerospace	2,215	2,407	2,657	2,928	3,357	3,673	4,060
Civil	12,712	12,000	12,104	12,448	12,531	12,847	13,537
Chemical	7,837	7,518	7,215	6,961	6,777	6,730	6,490
Electrical	15,677	15,315	15,626	17,057	18,876	18,908	18,110
Computer	5,370	6,316	6,281	7,641	7,698	7,127	6,602
Biological	843	764	774	811	882	876	894
Architectural	676	675	615	740	757	892	745
Industrial	6,244	6,180	6,351	6,810	7,358	7,087	6,675

Taken together, these statistics highlight a clear need and opportunity for the development of more university AE programs in the U.S. The supply of architectural engineers is lower – and decreasing – relative to increasing industry demand.

Faculty by Name and Area of Specialization

There are currently ten tenured or tenure-track faculty within the Durham School of Architectural Engineering and Construction associated with the Architectural Engineering Graduate Faculty. These faculty members are listed in Table 6, and their CV's are attached to the end of this section.

Table 6. Current Architectural Engineering Graduate Faculty

Name	Position	Area of Specialization
Moe Alahmad, PhD, PE	Assistant Professor	Electrical
Ece Erdogmus, PhD	Associate Professor	Structural
Josephine Lau, PhD	Assistant Professor	Mechanical
Siu-Kit Lau, PhD, CEng	Assistant Professor	Acoustical and Mechanical
Haorong Li, PhD	Associate Professor	Mechanical
Mingsheng Liu, PhD, PE	Professor	Mechanical
Dale Tiller, DPhil	Associate Professor	Lighting and Electrical
Lily Wang, PhD, PE	Associate Professor	Acoustical
Clarence Waters, PhD, PE	Professor	Lighting and Electrical
Gren Yuill, PhD	Professor	Mechanical

Architectural Engineering PhD Program Proposal

Information on PhD Students, Focused in AE

In March of 2002 the Graduate Council of the University of Nebraska at Lincoln approved a PhD Field in Architectural Engineering within the College of Engineering's unified PhD program. Since that time, we have had 21 PhD graduates from the Architectural Engineering focus of the Unified PhD in the College of Engineering (Table 7), and currently there are 17 PhD students enrolled within our program (Table 8).

Table 7. PhD Graduates from the Unified PhD within the College of Engineering, Specializing in AE

Year Graduated	Name	Current Position/Employer
2004	Yujie Cui	Nexant Inc.
2004	Xin Hu	Pacific Gas and Electric Company
2004	Ik-Seong Joo	BENEFF
2004	Song Li	Assistant Professor at University of Oklahoma in School of Aerospace and Mechanical Engineering
2005	Dong Dayu	VisionBee
2005	Simeng Liu	Bes-tech Inc.
2005	Gang Wang	Assistant Professor at Texas A&M Kingsville in Civil and Architectural Engineering
2006	David Bradley	Assistant Professor at Vassar College in Physics and Astronomy
2006	Guopeng Liu	Pacific Northwest National Laboratory
2006	Erica Ryherd	Assistant Professor at Georgia Institute of Technology in Woodruff School of Mechanical Engineering
2006	Bin Zheng	DTL Controls
2007	Jonathan Protzman	Assistant Professor at University of Colorado-Boulder in Civil, Environmental and Architectural Engineering
2007	Xin Guo	DDP Engineered LED Solutions
2008	Michelle Eble-Hankins	Alvine Engineering
2008	Xiufeng Peng	Lawrence Berkeley Laboratories
2008	Jonathan Rathsam	NASA Langley Research Center
2008	Michelle Vigeant	Assistant Professor at University of Hartford in Mechanical Engineering
2009	Younghum Cho	Kumoh National Institute of Technology
2009	Andrew Sorensen	Assistant Professor at Idaho State University in Civil and Environmental Engineering (Fall 2011-)
2010	Lixia Wu	Bes-tech Inc.
2010	Zhan Wang	Bes-tech Inc.

Table 8. PhD Students Currently Enrolled in the Unified PhD within the College of Engineering, Specializing in AE

Matriculated	Student Name	Faculty Advisor
Fall 2006	Lauren Ronsse	L. Wang
Fall 2006	Keke Zheng	H. Li
Spring 2007	Huojun Yang	H. Li
Fall 2007	Catherine Armwood	E. Erdogmus
Fall 2007	Yunhua Li	M. Liu
Fall 2007	Mo Yang	H. Li
Summer 2008	Daihong Yu	H. Li
Fall 2008	Yifan Shi	M. Liu
Fall 2008	Xinzhi Zhao	H. Li
Spring 2009	Bei Zhang	M. Liu
Fall 2009	Cody Buckley	E. Erdogmus
Fall 2009	Carl Hart	S. Lau
Fall 2009	Xiaoyu Liu	H. Li
Fall 2009	Yuye Peng	H. Li
Fall 2010	Xingbin Lin	J. Lau
Fall 2010	Zhao Peng	L. Wang
Fall 2010	Chunxiao Su	J. Lau

Background of students

The majority of our PhD students do have undergraduate engineering degrees in Architectural Engineering or related fields (e.g. Civil Engineering, Mechanical Engineering, etc.). A few have undergraduate degrees in other STEM fields, such as physics or mathematics. Table 9 lists the domestic PhD graduates and current students, along with their previous institutions and departments in which they studied. We have also drawn a large pool of students from international institutions, particularly those in Asia that do teach Building Services Engineering.

Table 9. Domestic PhD Graduates and Current Students in AE and their Previous Institutions and Departments

Name and Year Graduated	Previous Institution	Previous Department
David Bradley (2006)	Grinnell College	Physics
Erica Bowden Ryherd (2006)	Kansas State University	Architectural Engineering
Jonathan Protzman (2007)	University of Nebraska	Architectural Engineering
Michelle Eble-Hankins (2008)	Kansas State University	Architectural Engineering
Jonathan Rathsam (2008)	Grinnell College	Physics

Michelle Vigeant (2008)	University of Alberta	Mechanical Engineering
Andrew Sorensen (2009)	University of Wyoming	Architectural Engineering
Lauren Ronsse (2011)	University of Kansas	Architectural Engineering
Catherine Armwood (In Progress)	Tennessee State University	Architectural Engineering
Cody Buckley (In Progress)	University of Evansville	Civil Engineering
Carl Hart (In Progress)	Illinois Institute of Technology	Architectural Engineering

Placement of students

As shown in Table 7, at least 7 of our 21 graduates now have tenure-track faculty positions at other academic institutions. One of these, David Bradley in the Physics Department at Vassar College, was just informed that he received a National Science Foundation CAREER Award for 2011. At least two other graduates received academic offers but did not accept them (Xin Hu to Kent State, and Michelle Eble-Hankins to Milwaukee School of Engineering).

Our other PhD graduates are all working in the building industry, in the areas of design, operations, or research.

Description of the PhD Curriculum

All doctoral students in AE are required to take, and pass, the AE Qualifying Examination before appointment of the Doctoral Thesis Committee. Students with a MS degree must take the Qualifying Exam within one year of matriculation, while students with only a BS degree must take the Qualifying Exam within two years.

The AE Qualifying Exam consists of one 4-hour long exam in a specific area of study within architectural engineering. The areas that are currently offered include:

- Building Mechanical Systems
- Acoustics
- Lighting
- Electrical
- Structures

A composite score of at least 70% is required to pass the Ph.D. Qualifying Examination. Students who score less than 70%, but more than 55%, are required to take and pass a supplementary oral examination. Those who do not pass the oral examination will be offered a second opportunity to take the Qualifying Examination within one calendar year. Students who do not pass the Qualifying Examination the second time will not be able to continue their program of graduate studies.

Students scoring less than 55% will have failed the exam. Students who fail will be offered a second opportunity to sit the exam within one calendar year, and must pass the exam in order to continue their graduate studies.

After passing the AE Qualifying Exam, the doctoral student appoints his/her Doctoral Thesis Committee. That committee is charged with advising the PhD student on coursework selection and research guidance, administering the Comprehensive Exam, and participating in the final doctoral dissertation defense. In addition to courses in Architectural Engineering, our students typically take classes in other engineering or related fields depending on their research topic, such as Civil Engineering, Mechanical Engineering, Electrical Engineering, Computer and Electronics Engineering, Math, Physics and Statistics.

A listing of the graduate courses regularly offered in Architectural Engineering and available to PhD students is provided below:

AREN 803. Building Communication Systems
AREN 805. Sustainable Building Design
AREN 808. Applied Experimental Design and Statistical Analysis
AREN 811. Indoor Air Quality Engineering
AREN 812. Building Control and Automation Systems
AREN 814. Building Energy III: Advanced
AREN 815. Building Energy Simulation and Performance Contracting
AREN 820. Lighting II: Theory, Design and Application
AREN 822. Electrical Systems for Buildings II
AREN 825. Daylighting
AREN 830. Advanced Noise Control
AREN 833. Advanced Architectural Acoustics
AREN 835. Electroacoustics
AREN 916. Building Energy Systems Modeling, Control and Optimization
AREN 918. Computational Fluid Dynamics Modeling of Indoor Environments
AREN 930. Current Topics in Architectural Acoustics
AREN 997. Research Other Than Thesis
AREN 998. Special Topics
AREN 999. Doctoral Dissertation

Available Facilities and Space

The AE program is physically located in the Peter Kiewit Institute (PKI) on the University of Nebraska – Omaha campus. Currently there are at least 28 desks in PKI which may be assigned by AE to our PhD students. There is a proposed renovation for PKI currently being planned, but the expectation is that there will still be sufficient space for our graduate students.

The research facilities for the AE Graduate Faculty are primarily located in the PKI as well. These include a number of laboratories, permitting research in all of the technical areas covered by the AE Graduate Faculty: lighting, electrical, mechanical, acoustical, and structural.

Additionally the Durham School of Architectural Engineering and Construction has one staff member (Charity Stahl) currently dedicated to graduate student services, who will be asked to handle the administrative work created by the offering of the Ph.D. in AE degree.

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Architectural Engineering PhD Program

	(FY_2012_) Year 1		(FY_2013_) Year 2		(FY_2014_) Year 3		(FY_2015_) Year 4		(FY_2016_) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty											0	$0
Professional											0	$0
Graduate assistants [1]	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$922,555
Support staff											0	$0
Subtotal	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$922,555
Operating												
General Operating												$0
Equipment												$0
New or renovated space												$0
Library/Information Resources												$0
Other												$0
Subtotal		$0		$0		$0		$0		$0		$0
Total Expenses	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$184,511	9.8	$184,511	**9.8**	**$922,555**

[1] These expenses are not new expense but are reallocation of existing assistanships from the unified Engineering PhD program.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Architectural Engineering PhD Program

	FY(_2012_) Year 1	FY(_2013_) Year 2	FY(_2014_) Year 3	FY(_2015_) Year 4	FY(_2016_) Year 5	**Total**
Reallocation of Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$176,400	$185,220	$194,481	$204,205	$214,415	$974,721
Other Funding						$0
1						$0
2						$0
3						$0
Total Revenue	$176,400	$185,220	$194,481	$204,205	$214,415	$974,721

[1] The tuition and fees do not represent new funding but are from tuition and fees normally received from the unified Engineering PhD program. The tuitions and fees are approximated based upon an assumed enrollment, number of credit hours generated per student per year and the revenue from each credit hour. For example, revenue for Year 1 is based upon the assumption that there will be 14 PhD students taking 18 credit hours per year at an average tuition and fees rate of $700 per credit hour resulting in a total revenue of $176,400. Revenue for Year 2 (and subsequent years) assumes a 5% combined yearly increase in student credit hour generation and average tuition and fees per credit hour resulting in a total revenue of $185,2200.

Proposal

Ph.D. in Biological Engineering

Developed by the Biological Systems Engineering Department

Presented to

The College of Engineering
University of Nebraska-Lincoln

March 31, 2011

Proposal

Ph.D. in Biological Engineering

Program Focus and Student Learning Outcomes
Biological Engineering is an engineering discipline founded upon the science of biology. Biological Engineering entails the application of concepts and methods of biology, chemistry, physics, and mathematics to solve problems in the life sciences. While biological engineering is a very broad discipline in itself, the focus of this degree program is on agricultural engineering, bio-energy systems, biomedical engineering, ecological and environmental engineering, and food and bio-process engineering. Students that earn a Ph.D. in Biological Engineering will

- Comprehend advanced knowledge in their field of specialization, in biological, chemical and physical sciences, and in mathematics and be able to apply this knowledge to novel situations
- Be prepared to conduct original research, analyze research results, synthesize research findings, evaluate the merit of their research results, present research results to professional audiences, and publish their research results in respected journals
- Be ready to teach undergraduate and/or graduate level courses in Biological Engineering and/or to develop and deliver effective educational programs in extension or other educational venues

The student learning outcomes will be achieved through a combination of coursework, seminars, conducting research, presenting and defending their research results, and through a guided teaching/extension experience. The core areas of study include advanced courses in mathematics, science, engineering science, and biological engineering.

Specializations
Students that earn a Ph.D. in Biological Engineering will select from three specializations, Agricultural Engineering, Biological Systems Engineering, or Biomedical Engineering. The Agricultural Engineering and Biological Systems Engineering Specializations will be departmental specializations while the Biomedical Engineering Specialization will be an interdepartmental specialization.

Justification of a Ph.D. Degree Program in Biological Engineering
The mission of the Department of Biological Systems Engineering (BSE) is to educate engineers and managers, conduct research, and transfer engineering technology to benefit agricultural, biological, and natural systems. The economy of Nebraska is dependent on agriculture and associated industries. Nebraska is among the national leaders in numerous agricultural indices such as irrigated land area, and the production of red meat, corn, ethanol, cattle and calves, soybean, etc. (Nebraska Department of Agriculture, 2010). Departmental research programs are administered by the Agricultural Research Division which is the public entity in Nebraska charged with conducting agricultural research. As the sole engineering program within the Agricultural Research Division, the BSE Department is committed to pursuing research activities that result in engineering solutions to enhance productivity and sustainability of agriculture and related industries and to enhance the understanding and management of critical natural resources, water, soil, and air. This commitment is also demonstrated by the presence of departmental

faculty at various UNL Research and Extension Centers throughout Nebraska. BSE faculty members are actively engaged in current university-wide programs such as the Water Center, Nebraska Center for Energy Sciences Research, Nebraska Center for Materials and Nanoscience, and the Life Science Initiative. The BSE Department has a strong Extension program that ensures research programs result in meaningful and immediate benefits to agricultural producers and related industries. The Nebraska Tractor Test Laboratory and the Industrial Agricultural Products Center have enabled the department to maintain strong collaborations with industry and commodity boards. With historically strong research programs focused on food, water, energy and biomedical systems, the BSE Department will play an important role in emerging university-wide programs such as the Water for Food Institute and the Nebraska Innovation Campus.

The proposed Ph.D. program in Biological Engineering will provide educational and research experiences to students in the areas of agricultural sensors and equipment testing, site specific crop management, bioenergy, biomedical engineering, environmental quality improvement, food and bioproducts engineering, and soil and water resources engineering, including irrigation engineering and ecosystems engineering. Producing the next generation of engineers and scientists in the above- mentioned areas is critical to addressing regional, national, and global challenges related to food, water, energy, and climate change, and their interactions. The International Energy Agency (IEA) and the United Nations Food and Agriculture Organization (FAO) predict that by 2030 the world will need to produce around 50% more food and energy while mitigating and adapting to climate change. It is no coincidence that job opportunities in these areas are projected to increase over the next several years. The USDA projects a 5% increase in the need for graduates with expertise in agricultural and food systems, renewable energy, and the environment. This contrasts with the evidence that between 2002 and 2008 there were nearly 10 percent fewer graduates produced in U.S. colleges and universities in these areas (Goeker et al., 2010). Additionally, in the 2010 Agriculture and Food Research Initiative Program, the USDA emphasized the need for a scientific workforce that could meet the demand of the emerging bio-based economy and address the challenges that climate change poses to agriculture and natural resources.

Biomedical Engineering applies engineering science to solve problems in human medicine. Over the past ten years biomedical engineering has been one of the fastest growing areas of research and education at UNL. Biomedical engineering as a discipline has also been growing rapidly at the regional and national levels. The United States Department of Labor reports that "biomedical engineers are expected to have employment growth of 72 percent over the projections decade (2008-2018), much faster than the average for all occupations. The aging of the population and a growing focus on health issues will drive demand for better medical devices and equipment designed by biomedical engineers. Along with the demand for more sophisticated medical equipment and procedures, an increased concern for cost-effectiveness will boost demand for biomedical engineers, particularly in pharmaceutical manufacturing and related industries." The BSE Department is uniquely qualified to meet this growing need at the University of Nebraska, given the department's core expertise of biology and engineering. Ph.D. candidates in Biological Engineering that specialize in biomedical engineering may concentrate in a wide area of research topics, including biosensors, tissue engineering, bioinstrumentation, and medical imaging.

With the BSE Department's research expertise in topics related to food, water and energy, and Biomedical Engineering, the proposed Ph.D. program in Biological Engineering with specializations in Agricultural Engineering, Biological Systems Engineering and Biomedical Engineering will be strongly positioned to address the workforce needs discussed above.

History of Program, Graduates, and Current Students

The first M.S. degree in Agricultural Engineering was awarded in 1908. In 1971, a Ph.D. Program was established as a field within the College of Engineering and Technology's unified Ph.D. program. The recent enrollment and number of graduates in the Ph.D. program are shown in Table 1. The program has been relatively stable with enrollment averaging about 12 students and the average number of graduates has been about 2.3 per year. The trends are for increased enrollment with 15 or 16 students currently in the Ph.D. program which has increased since 2005 when the department set a goal of 20 students, which will lead to increased rates of graduation.

Table 1. Enrollment and Graduation Rates of Ph.D.'s in Engineering in the Biological Systems Engineering Department

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Enrollment	12	12	10	7	7	11	9	12	13	15	15	16
Graduates	3	2	3	3	2	1	2	0	3	4	--	--

The graduates for the 2000-2009 period are listed in Table 2. Based on the graduates from the 10-year period of 2000-2009, approximately 2/3 of the students were international students with the majority being from South American countries, India, and China. Upon graduation, approximately 1/3 of the international students returned to their home countries for employment. All of the graduates were fully employed upon graduation with about 60 percent being placed in academic institutions or government research agencies and 40 percent being placed in private industry. The successful placement of graduates indicates a demand for a Ph.D. in this field of engineering.

Table 2. 2000-2009 Graduates, Ph.D. in Engineering in the Biological Systems Engineering Department

Student Name	PhD	Country	Year Graduated	Prior Degrees	Advisor	Placement
Arumi Jose	ENGR	Chile	2000	Univ Tenica Federico Santa Maria (BS) UNL MS/PhD	Martin/Watts	Faculty member, University of Concepcion, Chili
Merino, Gabriel	ENGR	Chile	2000	University of Concepcion, Chile (MS) Univ Tenica Federico Santa Maria (BS)	Jones	Faculty member, University of Concepcion, Chili
Pohl, Steven	ENGR	USA	2000	South Dakota State University (MS) South Dakota State Univ (BS)	Schulte	Faculty member, South Dakota State University
Hindman, Timothy	ENGR	USA	2001	Wichita State University (MS) University of Nebraska (BS)	Meyer	Deceased, Previously with Duncan Aviation
Lochte-Watson, Karen	ENGR	USA	2001	University of Kentucky (MS) Texas A&M University College Station (BS)	Weller	Continuous Improvement Manager ConAgra Mills, Fredricksburg,TX
Koppolu, Ajoy	ENGR	India	2002	Indian Institute of Science (MS) Bangalore University (BS)	Clements	
Koppolu, Lakshmi	ENGR	India	2002	University of Nebraska (MS) Kakatiya University (BS)	Clements	
Skonard, Christopher	ENGR	USA	2002	South Dakota State Univ. (MS) South Dakota State Univ (BS)	Martin	Baumgartner Evironics, Inc.
Fernando, Sandun	ENGR	Sir-Lanka	2003	University of Nebraska (MS) University of Peradeniya (BS)	Hanna	Faculty member, Texas A&M University
Ganjyal, Girish	ENGR	India	2003	Asian Institute of Technology (MS) University of Agric Sciences (BS)	Hanna/Jones	Senior Engineer, Pepsico Advanced Research, Plano, TX
Helmers, Matthew	ENGR	USA	2003	Virginia Poly Inst & State Univ (MS) Iowa State University (BS)	Eisenhauer	Faculty member, Iowa State University
Amezquita, Alejandro	ENGR	Columbia	2004	University of Nebraska (MS) LaSalle Univ. Corporation (BS)	Weller	Risk Assessor, Unilever Safety and Environmental Assurance Centre
Camargo-Neto, Joao	ENGR	Brazil	2004	Fed. Univ. of Espirito, Brazil (MS) Inst de Apesquisas Espaciais (BS)	Meyer	Brazil Emrapa Informatica Agropecuaria
Guan, Junjie	ENGR	China	2005	University of Nebraska (MS) South China Agricultural U. (BS)	Hanna	Senior Researcher, Cadbury Chocolate

Hay, Christopher	ENGR	USA	2006	Colorado State University (MS) Colorado State University (BS)	Franti	Faculty member, South Dakota State University
Sethuramasamyraja, Balaji	ENGR	India	2006	University of Cincinati (MS) University of Madras (BS)	Adamchuk	Assistant Professor, Department of Industrial Technology, California State University, Fresno
Huda, Shah	ENGR	USA	2008	Institute of Textile Technology (MS) West Virginia Inst of Technology (BS)	Yang	Guilford Mills, North Carolina, Senior Engineer of R & D
Lagos, Luis Octavio	ENGR	Chile	2008	Univ. de Concepcion (MS) Univ. de Concepcion (BS)	Martin/S. Irmak	Faculty member University of Concepcion, Chile
Lee, Siew Yoong	ENGR	Malaysia	2008	University of California Davis (MS) Univ of Agriculture-Malaysia (BS)	Hanna	Scientist II Boehringer Ingelheim Vetmedica, Fort Dodge, IA
Henry, Christopher Garret	ENGR	USA	2009	Kansas State University (MS) Kansas State University (BS)	Schulte	Extension Engineer, University of Nebraska-Lincoln
Kumar, Ajay	ENGR	India	2009	University of Nebraska (MS) Indian Inst of Tech-Kharagpur (BS)	Hanna/Jones	Faculty member, Oklahoma State University
Pushpadass, Heartwin	ENGR	India	2009	Tamil Nadu Agric. Univ. (MS) Tamil Nadu Agric. Univ. (BS)	Hanna	Faculty member, Dairy Research Institute, INDIA
Singh, Ramesh	ENGR	India	2009	Indian Inst. Of Tech. Kharagpur (MS) Rajendra Agricultural University (BS)	A. Irmak/Martin	Research Scientist, , EROS Center USGS

Admission

In general, students entering the Ph.D. program in Biological Engineering are expected to have previously earned an M.S. degree and hold at least one degree in engineering or a closely related field (equivalent major). Students that do not have a previous degree in engineering may be required to complete deficiency coursework in mathematics, science, and engineering sciences. The recommended preparatory curriculum for students entering a BSE graduate program can be found at: http://bse.unl.edu/Grad/checklist_mar07.pdf

All international students and applicants from non-equivalents majors are expected to complete the Graduate Record Examination (GRE) prior to application to the program. International students are expected to complete and score a minimum of 80 on the internet based TOEFL exam. All applications must include three letters of recommendation and a letter of interest or intent.

Applications are reviewed by the BSE Graduate Committee. Generally, applications for the Spring semester must be complete before the previous October 1 and for the Fall semester by the previous March 1.

Financial Support
In general, the students in the BSE Departmental graduate programs are supported by graduate research assistantships. The current nominal Ph.D. graduate research assistantship is $20,000 per year in BSE Department. The department also provides health insurance and tuition remission benefits resulting in a total support package close to $28,500 per year. The department has a State funded assistantship pool that totaled $139,000 in 2010. Extramural funding is also used substantially by faculty members to support graduate research assistantships and graduate research programs. Extramural funding totaled about $3,000,000 in FY 2010.

Program Requirements
The program follows and meets all of the requirements set forth for a Ph.D. degree by Graduate Studies at UNL. Ninety credit hours beyond the B.S. degree are required with a maximum of 30 credit hours accepted for the M.S. degree. Of the 60 credit hours within the Ph.D. degree itself, approximately 24 credit hours are assigned to the dissertation research. A Program of Studies is developed and approved by the student's supervisory committee and the Dean of Graduate Studies before 45 credit hours of the 90 credit hours have accumulated. The Ph. D. degree in Biological Engineering requires two groups of core courses (18 credit hours) which are given as:

Group A: Mathematics (12 hours required, with at least one course in each of the two areas)
1) Statistics
2) Numerical Analysis (including linear algebra, advanced calculus, complex variables and partial differential equations)

Group B: Support Sciences (non-engineering) (six hours required)
1) Biological Science (e.g., plant/animal physiology, microbiology)
2) Earth Science (e.g., soil physics, climatology)
3) Chemistry (e.g., biochemistry, physical chemistry)

All students pursuing a Ph.D. in Biological Engineering are required to complete both AGEN/BSEN 899 and AGEN/BSEN 989, Seminar I and Seminar II, respectively. In addition to the seminar requirements, all Ph.D. students must complete their graduate program with at least three credit hours from courses offered in the BSE Department that are open exclusively to graduate students. These requirements do not supersede the UNL Graduate Studies requirements. The Ph.D. degree should ordinarily take no more than about three years to complete for students that entered the program with a Master of Science degree.

Table 3 lists the graduate courses offered within the BSE Department.

Graduate Student Teaching/Extension Experience
All graduate students that receive an assistantship, fellowship, or hourly wage that is administered by the BSE Department must complete a short-term assignment in the Department's teaching and/or extension program unless they had an equivalent or more extensive experience before entering UNL. The objective is for graduate students to gain experience in the application of teaching/extension methodology. Ph.D. students must complete two experiences and can select from either teaching, extension, or a combination of the two. The

scope of each experience is intended to be relatively short term (a minimum of one to two weeks of effort on the part of the student). Grading papers or performing remedial tasks in teaching laboratories will not satisfy the educational experience requirement. In concert with their advisor, students should submit an education experience plan to the chair of the BSE Department's Graduate Committee for approval. A sponsor of each educational experience is selected from the BSE faculty with approval by the student's advisor and the chair of the BSE Graduate Committee. The advisor can serve, and often does serve, as the sponsor.

Table 3. BSEN and AGEN Graduate Level Courses

BSEN	814	Medical Imaging Systems	Bashford	Fall
BSEN	816	Introduction to Biomaterials	Pannier	Fall
BSEN	818	Tissue Engineering	Pannier	Spring
BSEN	822	Pollution Prev: Principles & Prac	Dvorak	Summer
AGEN	824	Machine Design in Ag Engy	Hoy	Fall
BSEN/AGEN	841	Animal Waste Management	Schulte	Fall-Even
BSEN	846	Unit Operations of Biological Proc	Weller	Spring
BSEN/AGEN	853	Irrigation & Drainage Sys Engr	Martin	Fall
BSEN/CIVE	855	Nonpoint source Pol Cont Engr	Schulte	Fall-Odd
BSEN/CIVE	858	Groundwater Engineering	Woldt	Spring
BSEN/AGEN	860	Instrumentation and Controls	Meyer	Fall
BSEN/AGEN	889	Seminar I	Weller	Fall
BSEN/AGEN	896	Special Problems	Staff	All
BSEN/AGEN	898	Internship	Staff	All
BSEN/AGEN	899	Masters Thesis	Staff	All
BSEN	951	Adv Model Bio Engr	Meyer/Jones	Fall-Odd
BSEN	953	Adv Irrig & Drain Sys	Martin	Fall
BSEN/NRES	954	Turbulent Trans Atmos	Verma	Spring-Odd
AGEN	954	Hydrologic Modeling of Small Watersheds	Eisenhauer	Spring-Odd
AGEN	989	Seminar II	Weller	Spring
BSEN/AGEN	998	Advanced Topics	Staff	All
BSEN/AGEN	999	Doctoral Dissertation	Staff	All

Language and Research Tool Requirement

Biological Engineering students do not have to meet a specific language or research tool requirement. The student's supervisory committee exercises this requirement on a case-by-case basis.

Appointment of Supervisory Committee

At the time of admission to the program, an advisor for the student is assigned by the BSE Department Graduate Committee. In order to assure that students are under careful advisement and mentoring throughout their careers, a supervisory committee is established before a doctoral student has accumulated 45 credit hours including any transfer hours but excluding research or language tools. The student's advisor serves as the chair of the supervisory committee. Upon recommendation of the BSE Department Graduate Committee, the Dean of Graduate Studies appoints, for each student, a supervisory committee of at least four Graduate Faculty members. All professors on the supervisory committee must either be on the Graduate Faculty or be non-graduate Faculty approved to perform specified Graduate Faculty duties. At least one Graduate Faculty member external to the Biological Systems Engineering faculty must be included on the committee responsible for supervising the student's doctoral program of studies. When the

student is pursuing a minor, the representative of the minor department on the committee may serve as the outside representative.

Comprehensive Examination and Admission to Candidacy
When a student has substantially completed studies in the doctoral program, he/she must pass a written comprehensive examination. The written comprehensive examination is not a repetition of course examinations but is an investigation of the student's breadth of understanding of the field of knowledge of which his/her special subject is a part.

At the discretion of the supervisory committee, the student may also be required to pass an oral comprehensive examination. The oral examination may include the minor or related fields in addition to the major field of study. The supervisory committee arranges for written or oral examinations.

Should the supervisory committee determine that the student has failed the comprehensive examination, upon their discretion; the student may retake the examination. Usually only two attempts to pass the comprehensive examination are permitted.

When the student has passed the comprehensive examination, the committee will recommend to the Dean of Graduate Studies the doctoral student's admission to candidacy by filing the Application for Admission to Candidacy for the doctoral degree, noting the dates of completing the comprehensive examination(s). The application must be filed at least seven months prior to the dissertation defense.

Final Examination
The final examination for the doctoral degree is oral and open to members of both the University community and the public. During the dissertation presentation and general questioning all persons may be present. However, at the end of the public hearing there will be a closed questioning portion of the examination where all persons except the candidate, supervisory committee, and invited faculty must be excused. The final examination will be given by the supervisory committee after the candidate's studies have been completed and the dissertation accepted. The committee also determines the character and length of the final examination, which is devoted to the special field of the dissertation.

Assessment of Learning Outcomes
Assessment of student performance and learning is largely the responsibility of the student's supervisory committee. Performance in courses and the comprehensive exam (process described earlier) are used to assess student comprehension of advanced knowledge within the degree and field of specialization. The chair of the supervisory committee and chair of the BSE Graduate Committee are informed by Graduate Studies if a student is not performing satisfactorily in his/her coursework.

The ability to apply this knowledge and conduct original research is demonstrated in the development of the Ph.D. dissertation proposal, the completion of the dissertation research, and the development and submission of the results in the appropriate refereed journals. The comprehensive exam and development of the dissertation research proposal are usually complete by the end of the second year (four semesters) of the Ph.D. program. In general, students follow

the "paper-format" for their dissertation, i.e., the dissertation is presented as a series of papers that are appropriate for publication in refereed journals. It is expected that one or more journal articles pertaining to the dissertation research be submitted by the time that the dissertation is defended.

The student's readiness to perform teaching or extensions functions is assessed by the sponsor(s) of the student's two teaching/extension experiences (discussed earlier). The sponsor must determine if the student has successfully fulfilled this requirement in their program.

At the beginning of each academic semester, the enrollment in the BSE graduate program is tabulated. At that time a directory of current students is prepared, new students to the program are announced, and the list of graduates from the most recent commencement(s) is tabulated with placement information. These data are used to assess the status of recruitment, retention, and graduation rates.

Cost of Program

Initially, this Ph.D. program will not add new expenses to the instructional programs in the BSE Department because, in effect, this is an existing program, i.e., the Agricultural and Biological Systems Engineering Field in the Unified Engineering Ph.D. program. Projected expenses will increase in the future due to program growth and increases in graduate research assistantship rates. Because of increased emphasis on the Ph.D. program, part of the program growth will be in lieu of the M.S. program. Also, a portion of the increasing expenses of the growing Ph.D. program will be covered by additional external support and differentiated tuition funds in the College of Engineering.

Faculty

The BSE Department has 28 full-time and four adjunct faculty members available to guide the research of Ph.D. students (Table 4). The faculty represents the wide-array of interest areas necessary to support the proposed program. The curriculum vita of each graduate faculty member are attached at the end of this report and in the pdf file titled *Biological Systems Engineering Graduate Faculty CVs.*

Table 4. Biological Systems Engineering Department Graduate Faculty

Name	Rank	Specialization
Gregory Bashford	Associate Professor	Biomedical Imaging, Biosignal Analysis, Diagnostic Ultrasound, Biofeedback
Tami Brown-Brandl	Adjunct Associate Professor	Animal Stress and Well-Being
Bruce Dvorak	Professor	Small System Drinking Water Issues, Applied Pollution Prevention
Roger Eigenberg	Adjunct Associate Professor	Animal Stress and Well-Being, Geospatial Location and Transport of Livestock Waste, Energy Recovery from Livestock Waste
Dean Eisenhauer	Professor	Hydrologic and Irrigation Engineering, Infiltration, Overland and Vadose Zone Flow
Thomas Franti	Associate	Surface Water Quality Engineering, Surface

	Professor	Water Management
John Gilley	Adjunct Professor	Soil and Water Conservation Engineering, Land Application of Manure, Surface Hydrology and Water Quality
Milford Hanna	Kenneth E. Morrison Professor	Value-Added Process Engineering, Physical Properties of Food
Roger Hoy	Professor	Machine Performance
Suat Irmak	Associate Professor	Soil and Water Resources Engineering, Irrigation Engineering, Crop Water Productivity, Microclimate and Surface Interactions, Evapotranspiration
David Jones	Professor	Modeling, Risk Assessment, Systems Analysis
Deepak Keshwani	Assistant Professor	Bioenergy Systems, Bioprocess Modeling
Michael Kocher	Associate Professor	Sensors and Controls, Planter Seed Spacing Performance, Tractor Performance Testing
William Kranz	Associate Professor	Irrigation Engineering
Adam Liska	Assistant Professor	Biofuels, Life Cycle Assessment, Greenhouse Gas Emissions
Derrel Martin	Professor	Irrigation and Water Resources Engineering and Management
George Meyer	Professor	Sensors and Machine Vision
Shadi Othman	Assistant Professor	Biomedical Imaging, Magnetic Resonance Elastrography, Soft Tissue Mechanobiology
Angela Pannier	Assistant Professor	Biomaterials, Nonviral Gene Delivery, Tissue Engineering, Mechanics of Embryonic Development
Jack Schinstock	Professor	Engine Power Systems
Dennis Schulte	Professor	Air Pollution, Nonpoint Source Pollution Control, Animal Waste Management
David Shelton	Professor	Soil and Water Conservation Engineering, Stormwater Management
John Smith	Professor	Machinery Management
Richard Stowell	Associate Professor	Animal Housing Systems, Odor and Gas Emissions, Heat Stress Abatement
Jeyamkondan Subbiah	Associate Professor	Spectral Imaging for Food and Biomedical Applications, Bioactives for Health, Food Safety Engineering, and Non-thermal Processing
Simon van Donk	Assistant Professor	Water Resources, Irrigation, Evapotranspiration
Curtis Weller	Professor	Food and Bioproducts Engineering, Value-Added Processing of Grain Sorghum
Wayne Woldt	Associate Professor	Groundwater Engineering and Management, Constructed Wetlands for Wastewater Treatment, Odor Management

Bryan Woodbury	Adjunct Associate Professor	Animal Waste Management, Water Quality, Air Emissions
Yiqi Yang	Charles Bessey Professor	Biopolymers and Biobased Materials
Ron Yoder	Professor and Head	Crop Water Use, Vadose Zone Transport of Water and Solutes
C. Dean Yonts	Associate Professor	Irrigation Engineering

Facilities

The main building for the Department, L. W. Chase Hall, was built in 1918-20 and completely renovated in 1981. Chase Hall has three floors with approximately 5,300 m^2 of floor space. In 1979, a two-story, 3,000 m^2 research laboratory building, Splinter Laboratories, was constructed. In addition to these two buildings, faculty members with joint appointments in the Department of Food Science and Technology have laboratory space in the Food Industry Complex, and the faculty member in the Textiles, Clothing and Design Department has laboratory space in the Home Economics Building. A 400 m^2 Water Sciences Laboratory is available on UNL's East Campus to analyze water samples and support water quality research related to contamination of ground and surface water. The two departmental buildings provide more than 2300 m^2 of research laboratory space plus an area of 810 m^2 for the Nebraska Power Laboratory. A description of specific laboratories follows.

Atmospheric Trace Gas Laboratory

This laboratory is home to the department's efforts in the areas of agricultural odor dispersion and biosphere-atmosphere gas exchange. The laboratory is used in the design, construction, testing, and calibration of micrometeorological sensors and data collection systems related to measurements of the exchange of trace gases (e.g., H_2O, CO_2, CH_4, volatile fatty acids, and other odorous compounds) between the land surface and the atmosphere.

Splinter Laboratory

The Biological Systems Engineering Research Laboratory houses the research shop, machinery laboratory, power laboratory, and the Tractor Test Laboratory. The research shop has all the traditional shop machinery, including mills, lathes, and welders to build any kind of research tool or equipment required by the faculty. A full-time shop supervisor-machinist and two part-time students currently make up the shop staff. The shop is also used for a methods class in welding and wood construction for vocational education students.

Biomedical Imaging and Biosignal Analysis

This laboratory, newly constructed in 2004, provides support for biomedical engineering research. The laboratory includes a scan area (for imaging human research subjects) and conventional benchtop space. The scan area is partitioned from the rest of the laboratory by hospital curtains for privacy. Major lab equipment includes a Siemens Antares commercial diagnostic ultrasound machine, tissue-mimicking phantoms, a ventilation hood, ultrasonic pulsers/receivers, arbitrary function generators, RF power amplifiers, digital oscilloscopes, and several custom-built translation tables. In addition, several National Instruments DAQ cards are

contained within high-power workstations. Computing resources include MATLAB®, LabVIEW, and Visual C++ software. Most experimental setups are capable of full computer control. The laboratory is used for medical imaging studies and biosignal analysis, such as ultrasound mammography for breast cancer screening, echodentography, cardiovascular flow quantification, ECG/EEG instrumentation, and evoked potentials for neurological experiments.

Engineering Biomaterials and Gene Delivery

The overall goal of the research conducted in this lab, which was constructed in 2008, is to understand the mechanisms which render cells responsive to DNA transfer, concentrating on the extracellular environment of the cell, as well as the intracellular processes and subsequent signaling involved during nonviral gene delivery. The lab is also collaborating with researchers both within and outside of the Department of Biological Systems Engineering, working to develop novel imaging and probing techniques to study cellular processes, including transfection kinetics, at the single cell level, as well as developing new biomaterials for gene delivery and tissue engineering applications. The main lab contains an enclosed dark room for fluorescence microscopy and 2 office workstations. Equipment within the main lab includes water purification systems, inverted Leica fluorescence microscope, Sorvall benchtop centrifuge, refrigerated microfuge, a fluorometer/ luminometer, UV/VIS spectrophotometer, Bio-Rad electrophoresis system, 4°C refrigerator, -20°C and -80°C freezers, as well as a bacterial incubator. The biosafety cabinet, Heracell CO2 incubators, cell microscope, liquid nitrogen tank, and a refrigerator are located in the adjacent cell culture lab.

Engineering Properties & Processing

This lab is used primarily for bioprocessing research and portions of several teaching laboratories are also conducted in the space. Research related to lipid extraction from grain sorghum, production of protein and chitosan films, and modeling heat transfer and microbial growth in meat products is conducted in this lab. Instructors who use the laboratory space for teaching could include the topics of engineering properties of biological materials, food processing unit operations and agricultural products processing and handling. Major equipment available in the lab includes two controlled environmental chambers, three chemical hoods, a freeze dryer, centrifuge, two drying ovens, three cross-flow grain dryers, four balances, three freezers and two refrigerators.

Environmental Engineering & Bioremediation

This laboratory and the adjacent Atmospheric Trace Gas Analysis Laboratory, are focal points of the Department's efforts in air quality research. In addition to air quality research equipment, the laboratory includes a walk-in environmental chamber, two biological incubators, two fume hoods and a variety of water quality research and bio-instrumentation equipment. In addition to advanced analytical equipment, a GC-Mass Spectrometer and an electronic nose are located in these laboratories.

Field Facilities

Faculty and students are able to conduct experiments and extension demonstrations at the department-managed Rogers Memorial Farm, a 300-acre farm located 12 miles east of Lincoln. The farm is typical of the rolling farmlands of eastern Nebraska and is managed by an agricultural research technician with oversight from the department's research farm committee.

Several classes use this no-till farm as a teaching laboratory for topics related to soil and water conservation, crop production, grain handling, machinery management, soil properties, and wildlife management. Currently, the primary research efforts include long-term conservation tillage, site-specific crop management, and buffer and filter strips. In addition, faculty members and students may use any of the four Research and Extension Center farms located at Concord, North Platte, and Scottsbluff and the Agricultural Research and Development Center located forty miles north of Lincoln near Mead, Nebraska.

Hydraulics

This laboratory is well-suited for teaching and research in water measurement, soil erosion, pump operations, pipeline hydraulics, open channel hydraulics, chemigation safety, and irrigation sprinkler profile analysis. Two vertical turbine and one horizontal centrifugal pump can supply up to 2,000 gpm for project needs. Water in the lab is supplied from a 12,500 gallon underground reservoir and is recirculated through the channel and pipe network. Water measurement equipment includes pipeline venturis and flow measurement flumes equipped with electronic transducers and ultrasonic measurement for pipelines.

Instructional Computing

Undergraduate and graduate students have access to a modern computer laboratory. This general laboratory has 38 Windows 7 workstations (3.0 and 1.8 GHz) with LCD monitors along, with high-speed laser black-and-white and color printing, and a flatbed scanner. Each workstation has office tools and specialized engineering design and mechanized systems software. A Windows 2003 (active directory) domain server provides for individual student accounts, private storage, and daily backup. The lab is equipped with a digital projector and screen for software instruction and formal demonstrations.

All departmental computers operate on a network, connecting the entire campus and outside world through the internet. UNL faculty, staff, and students communicate using electronic mail, within the University and around the world, and have access to University and world-wide library sources. Students also have access to individual course materials 24-hours per day through the Academic Portal, a web-based support system for teaching. In addition, an adjacent student project design room has computer support and space for student projects. The department's full-time computer specialist is responsible for the daily operation of the network, account administration, and is available to solve computer problems. Instructional computing, video-based visualizers, and projected multimedia presentations are provided in the five classrooms in L. W. Chase Hall.

Land Measure & Surveying Laboratory

Equipment in this lab meet the land surveying needs for research and teaching. Tripod leveling equipment includes six automatic level systems, a laser system with six targets, and an electronic total surveying station with two theodelites. The lab also has two backpack mapping grade GPS units. For area and distance measure from maps, seven electronic planimeters and map measuring wheels are available.

Machine Vision

The Machine Vision Laboratory contains special workstations and equipment for developing and

testing machine vision applications. The lab has been used for imaging and plant (weed) detection and species identification, and other machine vision projects with Agronomy Horticulture and Food Technology. Equipment includes 700 MHz, 3.0 GHz and 3.2 GHz Windows XP workstations with commercial and custom image processing programs, Visual Basic®, Visual C++, MATLAB®, LabView®, Neural-Network and Fuzzy logic toolboxes, and SAS® statistics. A controlled-lighting room provides standard 5500K daylight room lighting and a special stand for studying light sources for imaging. Digital cameras can be accessed or controlled from a nearby computer. Equipment includes several light intensity and color temperature meters. The laboratory has a spectro radiometer, standardization panel, digital cameras, and scanners, including matched pairs of CCD black-and-white and color video cameras. The lab has a selection of precision optical band pass filters. Projects have ranged from machine vision applications (particularly weed detection) to seed spacing measurement and soil sensors development. Other projects were related to the departmental undergraduate and graduate programs.

Nebraska Tractor Test Laboratory

The Nebraska Tractor Test Laboratory tests and measures tractor performance and is the only such facility in the western hemisphere; the Lab is the de facto national tractor testing lab, testing tractors for all major brands sold in the U.S, and collaborating with other national tractor testing labs around the world. Test engineers and staff conduct performance tests on agricultural tractors above 40 horsepower. Equipment includes dynamometers, data acquisition equipment, hydraulic power and flow, and sound level measuring devices. The Laboratory serves the state and nation by testing and making the tractor performance results available to the public, free of charge, from their website. Usually, eight to ten students work part-time at the Laboratory throughout the academic year. The Laboratory also contracts with private industry in testing and evaluating other entities such as other types of vehicles, e.g., construction equipment and off-road vehicles, alternative fuels, and engine energy savings devices.

Plant Biophysics

The plant biophysics laboratory contains three large, reach-in, programmable Conviron E-15® environmental chambers, each with computer support for plant growth modeling, thermodynamics, theoretical energy-based, water use calculations, and plant and turf grass calorimetry. The newest chamber provides approximately 1,400 micro-moles of photosynthetically-active radiation (PAR) or equivalent to one-third full sunlight. Water use measurements and crop stress index development use electronic load cell lysimeters, single leaf porometer systems, psychrometers, self-equilibrating manometers, and leaf temperature measurements, using conventional infrared thermometers and IRT/c's. The laboratory has a low-resolution, pyroelectric thermal imaging system, for assessing spatial emissivity and surface temperatures. CO_2 gas exchange and humidity measurements are available. The laboratory has precision pyranometer and PAR sensors. Spectral analyses for reflection and transmission of biological materials can be performed, using a diffraction grating spectroradiometer and integrating sphere. Modern 12- and 16-bit data logging equipment is available, along with computer and network support. Using plants from greenhouses on East Campus for short-term controlled-environment analyses, the environmental chambers have successfully demonstrated dynamic crop temperature responses to moisture stress, infrared heating, such as might be used in greenhouses, and plant-directed drip irrigation.

Sensors and Controls

The Sensor and Controls Laboratory is equipped with special tools for development and testing applications based on microprocessor data acquisition and processing, and includes several workstations with various programming and data management software packages. On-the-go soil property mapping coupled with a Global Positioning System (GPS) receiver is being used with various instruments including imaging equipment, optical tools, electrochemical meters and other sensor components. Seed spacing instrumentation for size, rate, pattern, and application on diverse terrain are more examples of some of the work being done in this lab.

Soil & Water Properties

This laboratory is equipped to measure saturated hydraulic conductivity, soil water release properties, bulk density, soil water content, and soil particle size. The equipment in the lab includes: falling head permeameters, a flexible wall permeameter, neutron radiation soil moisture meter, and Time Domain Reflectrometry for soil water measurement, thermocouple psychrometers, Tempe and pressure plate chambers, and fluorescent dye tracing equipment.

TREM Laboratory

The Translational and REgenerative Medicine imaging laboratory is dedicated to developing novel imaging biomarkers, in particular focusing on tissue engineering and cancer. The central goal of the lab is to mesh engineering tools with biological systems. Additionally, TREM provides opportunities for Nebraska's youth to learn about bioimaging and stem cell research.

Value-added Processing

The Industrial Agricultural Products Center extrusion lab is located on the second floor of Splinter Labs. This laboratory is dedicated primarily to extrusion research. Both single-screw and twin-screw computer-operated C.W. Brabender lab scale extruders are located in this laboratory. Numerous screw and die configurations are available, as well as compounding and film blowing capabilities. The laboratory is equipped to determine the physical characteristics, mechanical and thermal properties and selected chemical properties of extruded materials. Current research includes starches, and lipid and protein-based polymers from corn, soybeans, sorghum, and beef tallow.

The physical and chemical properties of biobased products, such as alternative fuels and polymers, are analyzed using the laboratories equipment. An Instron Universal Testing Machine, Brookfield viscometers, and general laboratory equipment are used to test the physical properties, while gas chromatography, differential scanning calorimetry, high performance liquid chromatography, Fourier transform infrared spectrometry, and bomb calorimetry are used to test thermal and chemical properties. Grinding and pelletizing equipment, and various pressurized and heat controlled reactors support product characterization and development efforts of these laboratory facilities

Pilot scale extrusion and oil expression facilities also are located in the Industrial Agricultural Products Center's pilot plant located at the Agricultural Research and Development Center near Mead, NE. The larger equipment at that facility supports commercial scale-up activities with industrial partners.

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Biological Engineering PhD Program

	(FY_2012_) Year 1		(FY_2013_) Year 2		(FY_2014_) Year 3		(FY_2015_) Year 4		(FY_2016_) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty											0	$0
Professional											0	$0
Graduate assistants [1]	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$751,690
Support staff											0	$0
Subtotal	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$751,690
Operating												
General Operating												$0
Equipment												$0
New or renovated space												$0
Library/Information Resources												$0
Other												$0
Subtotal		$0		$0		$0		$0		$0		$0
Total Expenses	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$150,338	4.25	$150,338	**4.25**	**$751,690**

[1] These expenses are not new expense but are reallocation of existing assistanships from the unified Engineering PhD program.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Biological Engineering PhD Program

	FY(_2012_) Year 1	FY(_2013_) Year 2	FY(_2014_) Year 3	FY(_2015_) Year 4	FY(_2016_) Year 5	**Total**
Reallocation of Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$163,800	$171,990	$180,590	$189,619	$199,100	$905,098
Other Funding						$0
1						$0
2						$0
3						$0
Total Revenue	$163,800	$171,990	$180,590	$189,619	$199,100	$905,098

[1] The tuition and fees do not represent new funding but are from tuition and fees normally received from the unified Engineering PhD program. The tuitions and fees are approximated based upon an assumed enrollment, number of credit hours generated per student per year and the revenue from each credit hour. For example, revenue for Year 1 is based upon the assumption that there will be 13 PhD students taking 18 credit hours per year at an average tuition and fees rate of $700 per credit hour resulting in a total revenue of $163,800. Revenue for Year 2 (and subsequent years) assumes a 5% combined yearly increase in student credit hour generation and average tuition and fees per credit hour resulting in a total revenue of $171,990.

University of Nebraska Lincoln

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Proposal for a Chemical & Biomolecular Engineering Field-based Ph.D. Program

Submitted March 28, 2011

1. Statement of Justification for the PhD Program

The mission of the University of Nebraska–Lincoln Chemical and Biomolecular Engineering Ph.D. Program will be to provide qualified students with a foundation in chemical and biomolecular engineering sciences and design methods to prepare them for successful professional careers and to contribute to the needs of society.

The chemical and biomolecular engineering program's mission aligns with all three parts of the University of Nebraska–Lincoln's stated mission, "The three-part mission of teaching, research and service serves as the charter challenge for the University of Nebraska–Lincoln." In carrying out this mission, the interflow of ideas and efforts among teaching, research and service produces an institutional impact that is greater than the sum of its separate parts, and insures a level of program quality consistent with the expectations and the needs of the people of Nebraska.

In pursuit of the program's mission, the Department of Chemical and Biomolecular Engineering has established the Educational Objectives given below:

- Prepare M.S. and Ph.D. chemical engineers to conduct innovative and independent research and development functions for industry, government and academia.
- Create and provide access to knowledge that is supportive of the needs of chemical and biomolecular engineering.
- Foster an intrinsic curiosity for life-long learning
- Respond to the technical needs for economic development and diversification in the state and region. Examples of successful alumni of our Ph.D. program working in the state and region include:
    - Dr. David Vu – currently works at Kamterter II L.L.C., a company focusing on crop spray technology, located in Lincoln, NE.
    - Dr. Sandra Noriega- currently employed at LNK Chemsolutions L.L.C., a company with core competencies in nanoparticle and nanofiber R&D for a variety of applications, such as toxicology, tissue engineering, encapsulation, and controlled release, located in Lincoln, NE.
    - Dr. Raffet Velarde-Ortiz – the newly appointed instrumentation manger of College of Engineering's BM3 core facility.
    - Dr. Lucia Petkovic – currently a senior scientist at the DOE's Idaho National Laboratory and has been a key member of a team that won this year's prestigious R&D 100 Award (http://www.rdmag.com/Awards/RD-100-Awards/2010/08/Biodiesel-goes-back-to-the-future/)

In addition to the needs of the state of Nebraska, chemical engineering is vital to the U.S. manufacturing sector, and spans a number of diverse fields that include the petroleum, mining, biomedical and materials industries. According to the most recent Bureau of Labor Statistics' study, the job outlook for engineers in general is expected to be good and on pace with the economy. Engineers in the biomedical field are expected to benefit the most since this is an area that is believed to experience the largest growth among all engineering disciplines in the near future. (Occupational Outlook Handbook, 2010-20111 Edition, published online on May 2010 http://www.bls.gov/oco/ocos027.htm#outlook). The mission and vision of the Chemical and Biomolecular Department is to train B.S., M.S. and Ph.D. graduate in precisely this field.

The Bureau of Labor Statistics' data tabulated below is in tune with our recent strategic move to change the name of our department from Chemical Engineering to Chemical & Biomolecular Engineering and to focus on the biomolecuar research emphasis of our faculty.

Projections data from the National Employment Matrix (Source: http://www.bls.gov/oco/ocos027.htm#projections_data)

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-18		Detailed Statistics	
				Number	Percent		
Engineers	17-2000	1,571,900	1,750,300	178,300	11	[PDF]	[XLS]
Aerospace engineers	17-2011	71,600	79,100	7,400	10	[PDF]	[XLS]
Agricultural engineers	17-2021	2,700	3,000	300	12	[PDF]	[XLS]
Biomedical engineers	17-2031	16,000	27,600	11,600	72	[PDF]	[XLS]
Chemical engineers	17-2041	31,700	31,000	-600	-2	[PDF]	[XLS]
Civil engineers	17-2051	278,400	345,900	67,600	24	[PDF]	[XLS]
Computer hardware engineers	17-2061	74,700	77,500	2,800	4	[PDF]	[XLS]
Electrical and electronics engineers	17-2070	301,500	304,600	3,100	1	[PDF]	[XLS]
Electrical engineers	17-2071	157,800	160,500	2,700	2	[PDF]	[XLS]
Electronics engineers, except computer	17-2072	143,700	144,100	400	0	[PDF]	[XLS]
Environmental engineers	17-2081	54,300	70,900	16,600	31	[PDF]	[XLS]
Industrial engineers, including health and safety	17-2110	240,400	273,700	33,200	14	[PDF]	[XLS]
Health and safety engineers, except mining safety engineers and inspectors	17-2111	25,700	28,300	2,600	10	[PDF]	[XLS]
Industrial engineers	17-2112	214,800	245,300	30,600	14	[PDF]	[XLS]
Marine engineers and naval architects	17-2121	8,500	9,000	500	6	[PDF]	[XLS]
Materials engineers	17-2131	24,400	26,600	2,300	9	[PDF]	[XLS]
Mechanical engineers	17-2141	238,700	253,100	14,400	6	[PDF]	[XLS]
Mining and geological engineers, including mining safety engineers	17-2151	7,100	8,200	1,100	15	[PDF]	[XLS]
Nuclear engineers	17-2161	16,900	18,800	1,900	11	[PDF]	[XLS]
Petroleum engineers	17-2171	21,900	25,900	4,000	18	[PDF]	[XLS]
All other engineers	17-2199	183,200	195,400	12,200	7	[PDF]	[XLS]

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

In the same study, median salaries for chemical and biomedical engineers are shown to be very competitive among all engineering disciplines.

Earnings (Source: http://www.bls.gov/oco/ocos027.htm#projections_data)

Specialty	Lowest 10%	Lowest 25%	Median	Highest 25%	Highest 10%
Aerospace engineers	$58,130	$72,390	$92,520	$114,530	$134,570
Agricultural engineers	43,150	55,430	68,730	86,400	108,470
Biomedical engineers	47,640	59,420	77,400	98,830	121,970
Chemical engineers	53,730	67,420	84,680	105,000	130,240
Civil engineers	48,140	58,960	74,600	94,470	115,630
Computer hardware engineers	59,170	76,250	97,400	122,750	148,590
Electrical engineers	52,990	64,910	82,160	102,520	125,810
Electronics engineers, except computer	55,330	68,400	86,370	106,870	129,920
Environmental engineers	45,310	56,980	74,020	94,280	115,430
Health and safety engineers, except mining safety engineers and inspectors	43,540	56,190	72,490	90,740	106,220
Industrial engineers	47,720	59,120	73,820	91,020	107,270
Marine engineers and naval architects	43,070	57,060	74,140	94,840	118,630
Materials engineers	51,420	63,830	81,820	102,040	124,470
Mechanical engineers	47,900	59,230	74,920	94,400	114,740
Mining and geological engineers, including mining safety engineers	45,020	57,970	75,960	96,030	122,750
Nuclear engineers	68,300	82,540	97,080	115,170	136,880
Petroleum engineers	57,820	80,040	108,020	148,700	>166,400
Engineers, all other	49,270	67,360	88,570	110,310	132,070

In a recent National Science Foundation study (Science and Engineering Indicators: 2010), the unemployment rate of recent Ph.D. graduates (1-5 yrs from graduation) in engineering sits at approximately 1.4%, which significantly lower than the 2010 average unemployment rate, and lower than those of engineering M.S. and B.S. degree holders. The global trend in education is to pursue a higher level of specialization.

(Source: Table 3.16, http://www.nsf.gov/statistics/seind10/c3/c3s4.htm#s5)

Table 3-16
Labor market indicators for recent S&E degree recipients 1–5 years after receiving degree, by field: 2006

Indicator and degree	All S&E fields	Highest degree field: Computer/ mathematical sciences	Life sciences	Physical sciences	Social sciences	Engineering
			Percent			
Unemployment rate						
Bachelor's	3.8	4.6	4.6	4.0	5.1	1.9
Master's	2.5	3.1	2.9	2.6	4.6	2.5
Doctorate	1.1	0.6	1.1	1.1	1.9	1.4
Involuntary out-of-field rate						
Bachelor's	11.0	8.5	9.9	9.4	15.7	3.6
Master's	4.2	3.5	4.1	6.4	9.5	2.9
Doctorate	1.8	1.6	0.6	4.1	4.0	2.5
			Dollars			
Average salary						
Bachelor's	39,500	48,600	31,700	35,900	34,400	54,000
Master's	55,000	65,000	45,500	44,700	42,100	67,300
Doctorate	56,000	72,700	54,700	63,300	57,800	75,000

NOTES: Average salary rounded to nearest $100. Unemployment rate for recent S&E degree recipients differs from rate for entire S&E labor force.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2006), http://sestat.nsf.gov.

Science and Engineering Indicators 2010

According to the Society of Women Engineers, chemical engineering had the highest percentage of female graduates (approximately 35%) among all engineering disciplines for the past 20 years (http://www.swe.org/SWE/RegionD/Sections/seFL/Templates/StatisticsonWomeninEngineering%5B1%5D.pdf). Both our graduate and undergraduate female enrollments have improved since we enhanced our biomolecular/biomedical focus.

According to the survey that included approximately 10,8000 respondents, *Psych Majors Aren't Happy with Options*, published by the Wall Street Journal on October 12, 2010 ,chemical engineering is the career that displays the highest job satisfaction of all majors, currently sitting at 54%.

Currently, courses of study in engineering leading to the doctoral degree are offered through the Unified Ph.D. Engineering Program which is governed by a graduate board of faculty members elected from each participating field in the college. In addition to addressing the traditional engineering fields, this program encourages multidisciplinary approaches to engineering research. One key drawback of this Unified Ph.D. program is that is is much less attractive than department specific programs as a tool for effective recruitment efforts. The propsed field-based program will be essential when competing against Big 10 peer institutions.

2. Faculty by Name and Area of Specialization

Name	Title	Area of Specialization
Yasar Demirel	Associate Professor	energy, thermodynamic analysis of energy systems, sustainable energy management, renewable energy and storage, enhancement in heat transfer
James Hendrix	Professor	the connections of ionic equilibrium and reaction kinetics to the processing of precious metal ores; the use of cyanide in the processing of gold ores; "green" chemistry and sustainable development connected with minerals exloitation
Srivatsan Kidambi	Assistant Professor	neural and stem cell tissue engineering, nano-scale drug delivery systems for gene therapy, novel thin films for sensor applications
Gustavo Larsen	Associate Chair & Professor	catalysis, adsorption, materials design
Michael Meagher	Professor	recombinant protein production, fermentation, membrane processing of n-butanol by pervaporation
Hossein Noureddini	Professor	renewable energy and resources, utilization of agricultural wastes, enzyme reactions
Ravi Saraf	Professor	electronic skin, electronics on bacterium, DNA and protein chip, dance of ions at the electrode, nanomaterials on DNA and polymer scaffold
Anuradha Subramanian	Professor	bioseparations, biomaterials, bioreactors, functional tissue engineering
Delmar Timm	Professor	composite materials comprised of polymeric matrix, theoretical modeling
Kevin Van Cott	Associate Professor	functional protemics, design and production of unnatural proteins, non-linear optical materials
William Velander	Department Chair & Professor	plasma-derived medicines and therapeutics, hemostatic devices, transgenic animals
Hendrik Viljoen	Professor	development of new methods for the synthesis and processing of materials; analysis of complex engineering systems with the aid of models and simulation; application of chemical reaction engineering principles to interdisciplinary problems

Faculty curricula vitae are included at the end of this document

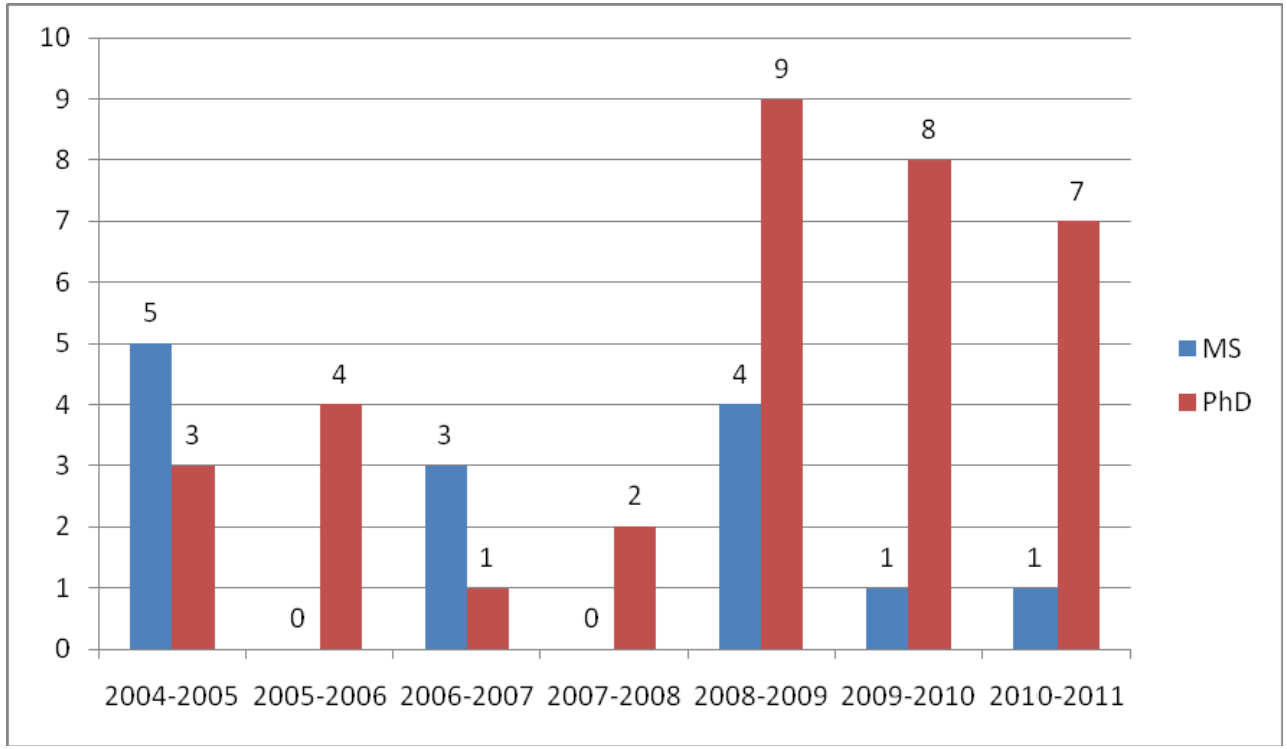
3. Students: Numbers for the Past 10 Years and Graduates

Enrollment

CURRENT TOTAL of 28 Graduate Students

- 25 Ph.D. Engineering, Chemical & Biomolecular Engineering Specialization
- 3 M.S. Chemical Engineering

New Graduate Student Enrollment by Program and Academic Year



Chemical & Biomolecular Engineering PhD Students Spring 2011 (Total 25 Students)

Student Name	Degree	Specialization	Program Start Date	Advisor/ Committee Chair	Committee Members	Prior Degree #1	Prior Degree #2	Prior Degree #3
Booth, Christine	PHD	Chemical & Biomolecular	2009, January	Hendrik Viljoen		BS Chemical Engineering, University of Pretoria		
Budhiraja, Gaurav	PHD	Chemical & Biomolecular	2009, January	Anu Subramanian	Kevin VanCott, Anu Subramanian, Donald Becker	BEng Biotechnology, Panjab University	MTech Medical Biotechnology, Indian Institute of Technology - Madras	
Dang, Jun	PHD	Chemical & Biomolecular	2007, January	Hossein Noureddini	Gustavo Larsen, Kevin VanCott, Dennis Schulte	BS Environmental Engineering, Sichuan University	MS Industrial Ecology, Technical University of Munich and Nanyang Technological University	
Fabian, Frank	MS/PHD	Chemical & Biomolecular	2010, August	Michael Meagher		Associates, Laboratory Science Technology, Southeast Community College	BS Chemical Engineering, University Nac del Cent del Peru	
Fatemi, Mostafa	PHD	Chemical & Biomolecular	2011, January	William Velander		BS Chemistry, University of Nebraska-Lincoln	BS Chemical Engineering, University of Nebraska-Lincoln	MS Environmental Engineering, University of Nebraska-Lincoln
Flodman, Hunter	BS/PHD	Chemical & Biomolecular	2009, August	Hossein Noureddini		Associates, Central Community College	BS Chemical Engineering, University of Nebraska-Lincoln	MS Environmental Engineering, University of Nebraska-Lincoln
Gonzalez, Daniela	PHD	Chemical & Biomolecular	2009, August	Gustavo Larsen	William Velander	Ingeniero, Bioengineer, National University of San Juan		
Hassler, Christopher	PHD	Chemical & Biomolecular	2009, January	Ravi Saraf		BS Mechanical Engineering, University of Nebraska-Lincoln	MS Mechanical Engineering, University of Nebraska-Lincoln	
Jarosz, Sylvia	BS/PHD	Chemical & Biomolecular	2010, May	Srivatsan Kidambi		BS Chemical Engineering, University of Nebraska-Lincoln		

Student Name	Degree	Specialization	Program Start Date	Advisor/ Committee Chair	Committee Members	Prior Degree #1	Prior Degree #2	Prior Degree #3
Kane, Jennifer	BS/MS/ PHD	Chemical & Biomolecular	2002, August (MS) 2008, May (PhD)	Ravi Saraf		BS Chemical Engineering, University of Nebraska-Lincoln	MS Chemical Engineering (pending), University of Nebraska-Lincoln	
Lee, Seung-Woo	PHD	Chemical & Biomolecular	2008, August	Ravi Saraf		BEng Fine Chemical Engineering & Applied Chemistry, Chungnam National University		
Louw, Tobias	MS/PHD	Chemical & Biomolecular	2009, January (MS), 2011, January (PhD)	Hendrik Viljoen		Beng Chemical Engineering, University of Pretoria	MS Chemical Engineering (pending), University of Nebraska-Lincoln	
Moore, David	PHD	Chemical & Biomolecular	2010, August	Ravi Saraf		BS Engineering with concentration in Electrical and Physics, Union University		
Nguyen, Chieu	BS/PHD	Chemical & Materials	2008, August	Ravi Saraf		BS Chemical Engineering, University of Nebraska-Lincoln		
Nguyen, Nghi	BS/PHD	Chemical & Materials	2008, August	Yasar Demirel		BS Chemical Engineering, University of Nebraska-Lincoln		
Ong, Kee Yang (Jason)	PHD	Chemical & Biomolecular	2008, August	Ravi Saraf		BS Biochemistry, University of Nebraska-Lincoln		
Parsons, Harry	BS/PHD	Chemical & Biomolecular	2010, May	Michael Meagher		BS Chemical Engineering, University of Nebraska-Lincoln		
Pavlik, Benjamin	MS/PHD	Chemical & Biomolecular	2010, August	Michael Meagher		BS Bioprocess Engineering, Keck Graduate Institute	MS Genetics, University of California-Davis	
Pena, Tiffany	PHD	Chemical & Biomolecular	2010, August	Mark Carlson	Gustavo Larsen, William Velander	BS Materials Engineering, California Polytechnic State University	MS General Engineering with Biomedical Concentration, California Polytechnic State University	

Student Name	Degree	Specialization	Program Start Date	Advisor/ Committee Chair	Committee Members	Prior Degree #1	Prior Degree #2	Prior Degree #3
Ragusa, Jorge	PHD	Chemical & Biomolecular	2009, August	Gustavo Larsen	William Velander	Ingeniero, Bioengineer, National University of San Juan		
Rodenhausen, Keith Brian	BS/PHD	Chemical & Biomolecular	2009, May	Mathias Schubert		BS Chemical Engineering, University of Nebraska-Lincoln		
Ter Maat, Joel	BS/MS/ PHD	Chemical & Biomolecular	2005, January	Anu Subramanian	David Hage, William Velander, Mark Griep	BS Chemical Engineering, University of Nebraska-Lincoln	MS Chemical Engineering (pending), University of Nebraska-Lincoln	
Tevatia, Rahul	PHD	Chemical & Biomolecular	2009, August	Yasar Demirel		BTech, Biotechnology, University School of Biotechnology, Guru Gobind Singh Indraprastha University Kashmere Gate	MTech, Biotechnology, University School of Biotechnology, Guru Gobind Singh Indraprastha University Kashmere Gate	
Vanderslice, Nicholas	PHD	Chemical & Biomolecular	2011, January	William Velander		BS Chemical Engineering, University of Missouri-Columbia		
Xu, Weijie (Jay)	PHD	Chemical & Biomolecular	2009, August	William Velander		BS Clinical Medicine, Tianjin Medical University	MEng, Peking Union Medical College	

Chemical & Biomolecular Engineering PhD Graduates, December 2001-December 2010 (Total 23 Students)

Student Name	Specialization	Graduation	Advisor/ Committee Chair	Committee Members	Prior Degree #1	Prior Degree #2	Prior Degree #3	Current Employer
Chian, Wei	Chemical	2002, May 11	Delmar Timm	Gustavo Larsen, Hendrik Viljoen, Hossein Noureddini, Yuris Dzenis	BS Organic Chemical Engineering, Zhejiang University	MS Engineering Science, Zhejiang University	MS Chemical Engineering, University of Nebraska-Lincoln	
Sezer, Ali Osman	Chemical & Materials	2003, Aug. 16	Jennifer Brand	Xiao Cheng Zeng, Brian Robertson, Jody Redepenning	BS Yildiz University	MS University of Nebraska-Lincoln		Assistant Professor, Department of Chemistry and Physics, California University of Pennsylvania
Whitney, Scott	Chemical	2004, May 8	Hendrik Viljoen	Delmar Timm, George Gogos	BS Chemical Engineering, University of Nebraska-Lincoln	MS Chemical Engineering, University of Nebraska-Lincoln		Post-Doctoral Research Associate, University of Nebraska-Lincoln
Amery, John	Chemical	2004, Dec. 18	Luther Davis Clements, Kenneth Nickerson	Jennifer Brand, Michael Meagher	University of Missouri-Columbia	University of Missouri-Columbia		Principal Scientist - Pfizer Global Research and Development - Biologics Pharmaceutical Sciences, St. Louis, MO
Gao, Xiaojian	Chemical	2004, Dec. 18	Hossein Noureddini	Gustavo Larsen, Delmar Timm, Michael Meagher, Stephen Ragsdale	BEng, Chemical Engineering, Tsinghua University	MS Chemical Engineering, University of Nebraska-Lincoln		Environmental Engineer, Iowa Department of Natural Resources
Velarde-Ortiz, Raffet	Chemical	2004, Dec. 18	Gustavo Larsen	Delmar Timm, Hendrik Viljoen, Marjorie Langell	BS Chemical Engineering, National Polytechnic Institute (Mexico)	MS Organic Chemistry, University of Nebraska-Lincoln		Manager, Biomechanics, Biomaterials and Biomedicine Instrumentation Facility, University of Nebraska-Lincoln
Gill, Rajinder Singh	Chemical	2005, Dec. 17	Gustavo Larsen	Anu Subramanian, Henkdrik Viljoen, Thomas George	BS Chemistry, Panjab University Chandigarh (India)	MS Statistics, Panjab University Chandigarh (India)	MS Chemical Engineering, University of Nebraska-Lincoln	
Vu, David	Chemical	2005, Dec. 17	Gustavo Larsen	Delmar Timm, Hendrik Viljoen, Milfored Hanna	BS Chemical Engineering	MS Chemical Engineering, University of Nebraska-Lincoln		

Student Name	Specialization	Graduation	Advisor/ Committee Chair	Committee Members	Prior Degree #1	Prior Degree #2	Prior Degree #3	Current Employer
Washington, Cicely	Chemical	2005, Dec. 17	William Velander	Anu Subramanian, Kevin VanCott	BS Chemical Engineering, Brown University	MEng Chemical Engineering, Virginia Polytechnic Institute and State University		Technical Leader-Principle Scientist, Abbott Molecular
Bachelder, Eric	Chemical	2006, Aug. 12	William Velander	Anu Subramanian, Kevin VanCott, Ravi Saraf, Henk Viljoen	BS, Michigan State University			Research Assistant Professor, College of Pharmacy, The Ohio State University
Gil, Geun-Cheol	Chemical	2006, Aug. 12	Kevin Van Cott	William Velander, Michael Meagher, Ashraf Raza	BS Chemical Engineering Chung-ang University	MEng, Kwangju Institute of Science & Technology		Sandia National Laboratories, Livermore, CA
Nosal, William	Chemical & Materials	2006, Dec. 16	John Woolam		BS Chemical Engineering, University of Nebraska-Lincoln	MS Chemical Engineering, University of Nebraska-Lincoln		
Balaz, Snjezana	Chemical & Materials	2007, May 5	Jennifer Brand	Brian Robertson, Susan Hallbeck, Peter Dowben	BS Northland College	MS Physics, The University of Salford (United Kingdom)		(?) Department of Physics and Astronomy, University of California, Riverside, CA
Ramireddy, Sreenivasula	Chemical	2007, Aug. 18	Michael Meagher	Alvin Surkan, Delmar Timm, Mehmet Inan, David Jones	BTech, Chemical Engineering, Osmania University (India)	MS Chemical Engineering, University of Nebraska-Lincoln		Lecturer, Chemical Engineering, Rajiv Gandi University of Knowledge Technologies
Sarkar, Sabyasachi	Chemical & Materials	2008, May 10	John Woolam	Ravi Saraf, Hendrik Viljoen, Florin Bobaru	BTech, Biotechnology and Biochemical Engineering, Indian Institute of Technology, Kharagpur	MS Biosystems Engineering, University of Minnesota-Twin Cities		Post-Doctoral Associate, University of Nebraska-Lincoln
Natta, Marcus	Chemical & Materials	2008, Aug. 1	Jennifer Brand	Peter Dowben, Susan Hallbeck, Neil Boag, Jerry Hudgins, Robert Fairchild	BS Physics, Math, Cameron University			Lecturer at Clarence Fitzroy Bryant College

Student Name	Specialization	Graduation	Advisor/ Committee Chair	Committee Members	Prior Degree #1	Prior Degree #2	Prior Degree #3	Current Employer
Byun, Jongwon	Chemical	2008, Dec. 20	Hossein Noureddini	Hendrik Viljoen, Gustavo Larsen, Milford Hanna	BEng, Kyung Hee University	MS Chemical Engineering, University of Nebraska-Lincoln		
Noriega, Sandra	Chemical & Biomolecular	2009, Dec. 19	Anu Subramania n	Gustavo Larsen, Mark Griep, Gregory Bashford	BS Chemical Engineering, National University of San Juan (Argentina)	MS Chemical Engineering, University of Nebraska-Lincoln		Associate Technology Specialist, LNK Chemsolutions, LLC, Lincoln, NE
Guha Thakurta, Sanjukta	Chemical & Biomolecular	2010, May 7	Anu Subramania n	Gustavo Larsen, Marjoire Langell, Gregory Bashford	BS Chemistry, University of Calcutta	BTech Chemical Tech, University of Calcutta	MTech, Metallurgical Engineering & Materials Science, Indian Institute of Technology - Bombay	Post-Doctoral Research Associate, University of Nebraska-Lincoln
Kador, Karl	Chemical & Biomolecular	2010, May 7	Anu Subramania n	William Velander, Gustavo Larsen, Mark Beatty	BS Chemistry, College of William and Mary	MS Chemical Engineering, University of Nebraska-Lincoln		Postdoc, Bascom Palmer Eye Institute, University of Miami Medical Center
Pienaar, Elsje	Chemical & Biomolecular	2010, May 7	Hendrik Viljoen	Kenneth Nickerson, Anu Subramanian, Alison Freifeld	BS Finanical Mathematics, University of Pretoria (South Africa)			(Postdoc, Division of Medical Microbiology?), Department of Clinical and Experimental Medicine, Linkoping University, Sweden
Calcaterra, Jennifer	Chemical & Biomolecular	2010, Aug. 13	William Velander	Anu Subramanian, Kevin VanCott, Iraklis Pipinos, Mark Carlson	BS Biochemistry, Beloit College	MS Bioengineering, Arizona State University	MBA, University of Nebraska-Lincoln	Post-Doctoral Research Associate, University of Nebraska-Lincoln
Sutton, Amanda	Chemical & Biomolecular	2010, Aug. 13	William Velander	Anu Subramanian, Kevin VanCott	BS Mechanical Engineering, Kettering University	MEng Chemical Engineering, Virginia Polytechnic Institute and State University		(Amanda Messer) Post-Doctoral Research Associate, University of California, Los Angeles (Paul Bajaj Laboratory)

4. Curriculum

Graduate Committee

The graduate faculty of the Department of Chemical and Biomolecular Engineering have formed a Graduate Committee. Gustavo Larsen has been designated chair of the Graduate Committee. William Velander, Department Chair, also serves as the current Ph.D. Field Chair. Members of the Graduate Committee serve as advisers and members of the Supervisory Committee(s) of their assigned student(s).

Research Areas

The Department of Chemical & Biomolecular Engineering offers a course of study designed for students who plan careers in a wide variety of industries, ranging from the chemical and process industries to biotechnology, electronics, and the environment. The faculty are currently pursuing relevant, cutting edge research in the following areas:

- Metabolic engineering related to old age and obesity in collaboration with the UNL Department of Biochemistry
- Developing new regenerative medical materials and therapies using bio- and nanotechnologies to speed the repair and regrowth of bone, blood vessels and soft tissues in vivo
- Partnering with international healthcare systems to develop abundant supplies of hemophilia medicines from the milk of genetically engineered livestock to treat 80% of the world's hemophilia patients
- Discovering a device to give robots a human sense of touch using nanotechnology
- Developing cutting edge genomic techniques like ultra-fast polymerase chain reaction (PCR) to search for emerging disease threats such as antibiotic-resistant tuberculosis
- Using proteomic instruments like a specialized mass spectrometer designed to search for new genetically engineered protein medicines
- Developing hemostatic devices that can stop fatal bleeding from trauma in civilian and military applications
- Developing a process for sustainable biofuels production

Recruitment

From the College of Engineering Strategic Plan Summary
August 30, 2007

"The goal of the College of Engineering is to become a consensus top forty engineering college in the U.S....In order to achieve our ambition, we need to continue to increase graduation rates, especially at the graduate level. In order to do this, we must continue to increase our research productivity so that we can hire additional graduate students."

Our Goal

- To place greater emphasis on Ph.D. recruitment and lesser emphasis on M.S.
- Through hand recruiting, *annually* enroll three quality Ph.D. students with an identifiable high potential for academic careers (initiated January 2007).
- Expand our search for high quality Ph.D. students by partnering recruitment efforts and research with the Department of Biochemistry and other departments of the life sciences at UNL (ie., 1st collaboration on "Algae Biofuels and Sustainable Process Design")

Admission Requirements

The Department of Chemical and Biomolecular Engineering adheres to the admissions guidelines outlined in the Graduate Studies Bulletin. Prospective students are required to submit their documents by the specified application deadlines, and meet the minimum entrance criteria, outlined in the Application Checklist. Upon receipt of all materials, their file is circulated for review by the Department Graduate Committee.

Application Deadlines
Fall Admission: February 1 Spring Admission: September 1

Application Checklist
Required by Office of Graduate Studies

- Online Application for Graduate Admission
- $50 non-refundable application processing fee
- One (1) set of official transcripts
- If your native language is not English: verification of English proficiency
- If you are not a US citizen and you expect to hold an F or J visa: financial resource information

Required by Chemical & Biomolecular Engineering

- Complete of the Department of Chemical & Biomolecular Engineering GAMES Application at https://games.unl.edu/GAMES/login.jsp. Graduate Studies will provide you with login information via email after you have completed the UNL Graduate Programs application online. (Please note that there may be a 24-hour delay between the submission of your application and the receipt of your GAMES login email.)
- Entrance exam(s): GRE. All applicants for admission must take the verbal, quantitative and analytical sections of the Graduate Record Exam (GRE) and should arrange to have their scores reported to the Graduates Studies Office at the University of Nebraska-Lincoln at the earliest possible date since action on admitting the applicant will not be taken until these scores are received. We practice holistic admissions and review all application materials. Competitive applicants usually receive a minimum of 400 on the verbal and 700 on the quantitative sections of the GRE. Students who are prior graduates of the University of Nebraska-Lincoln are not required to take the GRE. The Department of Chemical Engineering reserves the right to consider admission without GRE in exceptional cases.
- All international applicants must complete the TOEFL with the following minimum scores: Paper-550, Computer-213, Internet-80
- Letter of intent/statement of purpose, one-page in length
- Curriculum vita/resume
- Three letters of recommendation

All supporting materials required by the Department of Chemical & Biomolecular Engineering are uploaded to the student's GAMES application.

Demonstration of foreign language proficiency or of competence in special research techniques is not a general requirement for the engineering Ph.D. degree. Decisions concerning such requirements are within the purview of the individual supervisory committees and will be consistent with the educational objectives of the student.

Admissions Review Process

After all application materials are received and the fee is paid (or waived), the file goes through three types of review: Preliminary Review, Departmental Review and Final Review. All applications for a given term are reviewed at a Departmental Graduate Committee Review meeting scheduled shortly after the application deadline for the approaching semester. Students will be notified of our decision approximately four weeks after this meeting, or a total of six weeks after the application deadline. The final decision for admission is made by the Department of Chemical and Biomolecular Engineering. The Office of Graduate Studies will send a letter of acceptance or denial after the review process is complete. The Department of Chemical and Biomolecular Engineering will send a second letter, when applicable, to extend an offer for a graduate teaching assistantship or graduate research assistantship.

Admission Categories

Admission to the Ph.D. program depends upon the student's previous academic performance and their preparedness to pursue advanced research and course work. The Chemical and Biomolecular Engineering Graduate Committee will

review the merit of the application as a whole in establishing whether to recommend admission; thus a student may be required to provide additional application materials beyond that which is required by the Graduate College.

- Admitted students who hold a M.S. or M.Eng. degree in chemical engineering from an accredited institution will be granted **full graduate standing** and may immediately begin Ph.D. course work.
- Admitted students who hold a B.S. degree in chemical engineering from an accredited institution are eligible to purse the ***Direct to Ph.D. Option***, which means they will be **provisionally admitted** to our Ph.D. program and will be required to successfully pass a Qualifying Examination at the end of their first semester at UNL before full graduate standing in the Ph.D. program is granted.
- Students who do not hold a B.S. or M.S. degree in chemical engineering may be provisionally admitted to the graduate program provided their degree is in a scientifically related field and all other admission criteria are met. Provisionally admitted students will be required to take the core courses of the M.S. chemical engineering (12 credit hours) and successfully pass a Qualifying Examination at the end of their second semester at UNL before full graduate standing is granted. In addition, the student's advisor may require students without a chemical engineering background to take, or test out of, undergraduate prerequisite deficiency courses. The required deficiency courses are specific to each individual student and will be outlined by their advisor and/or graduate committee. After a student is admitted, he/she may request an advising appointment with either his/her assigned faculty advisor or the graduate chair, prior to enrolling for classes, to outline a specific program of studies based on his/her specific educational background.
    - Examples of scientifically related fields include, but are not limited to; other engineering majors, biochemistry, chemistry, biology, physics, and pre-med programs.

Qualifying Exam

Students in the Ph.D. program of the Department of Chemical & Biomolecular Engineering must pass a written qualifying examination. The exam will be given in four subject areas of traditional chemical engineering:

- Transport Phenomena
- Reaction Kinetics
- Thermodynamics
- Mathematical & Computational Methods

Students will be tested in two areas per day for up to three hours on each subject on two consecutive days. The exams are open book and will be graded Pass or Fail.

Students with a bachelor's or master's degree in chemical engineering will take the qualifying exam at the end of their first semester in the Ph.D. program. Should they fail one or more of the exam areas, they will have a second chance to pass the failed exam area(s) only, at the end of their second semester.

Students who do not have a bachelor's or master's degree in chemical engineering will take the qualifying exam at the end of their second semester in the Ph.D. program. Should they fail one or more of the exam areas, they will have a second chance to pass the failed exam area(s) only, at the end of their third semester.

The purpose of the qualifying exam shall be:

- To function as a quality filter for Ph.D. studies,
- To establish a consistent standard in the Department,
- To serve as an assessment tool for the Department.

The exam is designed to test a broad understanding of generally accepted undergraduate engineering science. Additional guidance is provided on the Department website. Students are also encouraged to seek counsel from their advisors.

Students who fail any portion of the four-part exam in two attempts will not be admitted to the Ph.D. program of the Department of Chemical & Biomolecular Engineering but if they meet the qualifications in every other regard may be given the opportunity to pursue a Master of Science degree.

Curriculum

The Chemical & Biomolecular Ph.D. Program will follow all UNL and College of Engineering requirements for the Doctor of Philosophy Degree outlined in the Graduate Studies Bulletin (http://bulletin.unl.edu/graduate/Doctoral_Degree_Requirements). This includes;

- Academic Residency
- Appointment of Supervisory Committee
- Changes to Supervisory Committee
- Program of Studies
- Language and Research Tool Requirement
- Comprehensive Examination and Admission to Candidacy
- Final Examination
- Dissertation
- Reading Committee
- Depositing the Dissertation

Students must complete the forms and meet the deadlines outlined by the Office of Graduate Studies. This summary of procedure should be studied carefully in connection with the Graduate College calendar. See Doctoral Degree Forms and Deadlines (http://www.unl.edu/gradstudies/current/doctoral.shtml).

Ph.D. Program of Studies

- Minimum of 90 semester hours, including a dissertation
- Minimum of 12 hours and a maximum of 55 hours of dissertation research
- At least half of the graduate work, including the dissertation, must be done in the UNL Department of Chemical & Biomolecular Engineering
- The remaining work, subject to the approval of the supervisory committee, includes either:
  - supporting courses in the same or in related departments, or
  - a minor field of study outside of the major department
    - The minor must include at least 15 hours with 6 hours in courses open exclusively to graduate students (900 level or 800 level without 400 level or lower counterparts)
    - It may be taken in any department which has been approved to offer a major leading to a masters degree
- The student may select a field of study which integrates material offered in two or more departments without meeting the specific major requirements
- Not fewer than 45 semester hours must be completed at UNL after the filing of the program of studies
- The time limit on granting the doctoral degree is eight years from the time of filing the student's program of studies in the Office of Graduate Studies.

Core Graduate Courses for Chemical & Biomolecular Engineering (CHME)

Fall Semester	Spring Semester
805. Multiple Contact Separation Processes (3 cr)	815. Advanced Chemical Engineering Analysis (3 cr)
825. Theoretical and Applied Thermodynamics for Chemical Engineers (3 cr)	845. Advanced Chemical Engineering Kinetics (3 cr)
835. Transport Phenomena (3 cr)	896. Transport Phenomena II (3 cr) *(newly taught ; pending curriculum action)*
847. Principles and Applications of Catalysis in Reaction Engineering (3 cr)	

Graduate Seminars

In an effort to teach scientific writing and presentation skills, Chemical & Biomolecular Engineering started a departmental Research Seminar Series in 2008. So far, 17 seminars have been presented. In addition, the Department has partnered with the Center for Biotechnology and the Nebraska Center for Materials and Nanoscience to bring speakers to campus as part of their seminar series.

Seminar in Chemical Engineering (CHME 900)

- This focus of this 1 credit hour course is student attendance at six scientific seminars hosted by UNL Departments outside Chemical Engineering throughout the semester
- At the beginning of the semester, the class decides on a master list of seminars
- After each attended seminar requires the students write abstracts and submit them via email to Professor Velander within 48 hours
- Each student gives a final 20 minute presentation based on two scientific publications by one of the seminar speakers

Chemical & Biomolecular Engineering Research Seminar Series

Throughout the Research Seminar Series, faculty of the Department of Chemical & Biomolecular Engineering and invited guest speakers from both academia and industry, present their research topics for the benefit of current and prospective graduate students, alumni, and chemical engineering professionals. During each seminar, speakers give a 30-40 minute presentation, immediately followed by a question and answer period. Typically there is no need to RSVP, however, refreshments are first-come, first-served. Interested students of any major, faculty, alumni, and members of AIChE are all encouraged to attend.

- Research areas to be presented throughout this series include:
- Biocatalysis
- Biomaterials
- Biomedical Engineering
- Biomolecular Engineering
- Environmental Engineering
- Heat Transfer
- Materials
- Modeling, Simulation & Theory
- Molecular Medicine
- Nanotechnology
- Polymers
- Reactors, Kinetics & Catalysis
- Surface & Interface Science
- Thermodynamics
- Tissue Engineering
- Transport Phenomena, Fluid Mechanics & Fluid Dynamics

Advising

Graduate student academic advisement is closely tied to the Department's assistantship structure and to the research advisor the student works with for their M.S. thesis or Ph.D. dissertation. In addition to their primary advisor, at anytime, a student may seek guidance from the Graduate Chair, Dr. Gustavo Larsen. Dr. Larsen also assists students who are not yet assigned a research or thesis advisor.

5. Facilities and space available to the program

Facilities & Equipment

Donald F. Othmer Hall
820 N. 16th St., Lincoln, NE 68588-0643

The Department of Chemical & Biomolecular Engineering is located in Donald F. Othmer Hall on the University of Nebraska-Lincoln City Campus. In addition to the Department, Othmer Hall houses Engineering Communications, Engineering Business and Finance, the College of Engineering Dean's Office suite and general purpose classrooms.

The four-story brick and limestone building, which opened in 2002, features the latest in research laboratory design, including a bio-process manufacturing facility; a state-of-the-art computer control system for laboratories; and next-generation distance education technology.

Funding for the $24 million building came from the estate of Mildred Topp Othmer, '28, who died in 1998. She was the widow of Donald F. Othmer, '24, a noted chemical engineer and professor at Polytechnic Institute of New York in Brooklyn. Donald graduated from the University of Nebraska with a bachelor's degree in chemical engineering and earned a master's degree and doctorate from the University of Michigan. He accumulated 150 patents throughout his career. In 1947, he and Raymond Kirk, a Polytechnic colleague, published the 27-volume Kirk-Othmer Encyclopedia of Chemical Technology, which is used in universities, research facilities and companies for chemical processes.

Biological Process Development Facility (BPDF)
3rd Floor Othmer Hall

The University of Nebraska-Lincoln Biological Process Development Facility is a turn-key academic process development facility with a full-time staff of 36 scientists and technicians dedicated to research and development and the rapid transition of human biologics into Phase I clinical testing. It is capable of producing Phase I injectables and Phase II oral biologics at the 500 L bioreactor-scale (http://bpdf.unl.edu). It requires 9 to 12 months to develop a scalable process for current Good Manufacturing Practices (cGMP) manufacturing and 2 to 3 months to produce Phase I clinical material. The BPDF recommends technology transfer to a commercial partner between Phase I and II, and continues to produce early Phase II material until technology transfer is completed.

The BPDF has eight groups: molecular biology, fermentation development, cell culture development, purification development, analytical methods development, quality control (analytical and microbiology), cGMP manufacturing (fermentation and purification pilot plant), and quality assurance. It has worked with 25 companies over the last 10 years on 29 clinical products. The Biological Process Development Facility has been under contract with the United States Army Medical Research and Materiel Command on the botulinum and ricin vaccine and human antibodies against botulinum. Recently, Dynport Vaccine Company was awarded $11 million to fast-track the development of a heptavalent vaccine against botulinum of which $6.5 million was awarded to the University of Nebraska-Lincoln. In addition, the Biological Process Development Facility is producing at the 500 L scale recombinant protein for Phase II oral studies and was responsible for all aspects of process development. It has successfully completed Quality Assurance audits by Cato Research (8/02/03) and Bioprocess Consultants (9/15/03) for early phase cGMP production agreements. The Biological Process Development Facility has the experience to develop, transition, and produce cGMP transgenic recombinant Factor IX for clinical trials.

Molecular Biology Lab (MBL)

The BPDF has established the Molecular Biology Laboratory (MBL) to provide University of Nebraska researchers with large amounts of proteins for research purposes and development of FINAL production clone for commercial production purposes. Initially, the MBL specialized in the use of the Pichia expression system, a eukaryotic expression system that has been successfully used to express a large variety of proteins. Depending upon the level of expression obtained for a particular protein, quantities ranging from milligrams to over a gram quantities can be readily produced using resources at the facility. The facility is capable of providing E. coli expression services as well. For those investigators that are not interested in developing purification procedures for their proteins of interest, the BPDF will also provide purification services. The establishment of the UNL BPDF Molecular Biology Laboratory is expected to

provide an important core infrastructure component for the life sciences in ongoing studies in fundamental biology, as well as studies in Vaccine developments.

Capabilities

- PCR
- Cloning
- Transformation
- Screening of transformants
- Northern, Southern and Western Analysis
- Electric Mobility Shift Essay (EMSA), [Gel shift Essay]
- Foot Printing Assay

Protein Expression Services

- Pichia vector construction and sequence confirmation
- Transformation
- screening for best producing clone
- Optimization at the shake flask level

Purification Development Lab (PDL)

The PDL performs bench-scale protein purification research and develops scalable purification processes for production of proteins under cGMP. The PDL is capable of both basic protein chemistry and process development and scaling-up a purification process into production. Production purification processes typically operate at column pressures below 50 to 75 psig, requiring large-bead resins designed specifically for process chromatography. The PDL uses these same resins, even at the very small scale (1 ml column) to insure scalability. The PDL cooperates with the AD/QCL in implementing analytical methods to quantitate the product. These method(s) could be as simple as a protein assay and a western blot or as complex as an ELISA or HPCL method. The analytical method is essential for following the expression of the protein during the fermentation and tracking the protein during purification. A reliable analytical method is critical to the timely development of a process.

Capabilities

The PDL is capable of developing all aspects of a purification process, starting with a fermentation extract. The PDL has experience with just about any chromatrography resin or chemistry, expanded bed adsorption chromatography, ultrafiltration, all forms of electrophoresis, and ELISA. The PDL has on numerous occasions successfully developed and transitioned a purification process to the pilot-scale for both GMP and non-GMP production.

Equipment

Major equipment include three Perseptive Biosystems BioCad Workstations, ISCO prep HPLC system, gel scanning system w/ computer and software, Dynex ELISA workstation w/ computer and software, electrophoresis equipment, and a Biospec cell disruption system and an EH-110 Microfluidizer for cell disruption.

cGMP Pilot Plant

The core of Othmer Hall, 1st & 2nd Floors

The Department of Chemical and Biomolecular Engineering completed the construction of a new, 2000 square-feet cGMP pilot plant that is flexible in design for processing biologics and will accommodate the bandage assembly process as well as scaled-up production of cGMP grade recombinant Factor XIII on a campaign basis. The pilot plant was completed September 2008 but has not yet hired staff. The utilities include unit operations to make high purity water for injection used in formulated injectable therapeutics.

Polymer Characterization Lab

122 Othmer Hall
Dr. Kevin Van Cott

This lab is fully equipped for polymer characterization with the following equipment: 4000 QTrap triple quadrupole/ion trap mass spectrometer; Dionex U3000 nanoflow LC system; 3 Waters 2695 HPLC systems with UV,

PDA, and fluorescence detectors; SDS PAGE and western blot apparatus; Ultra-low freezers and speed-vac system; five desktop computers and one laptop computer are used for equipment control and general purpose.

Protein Purification and Characterization Lab
124 Othmer Hall
Dr. William H. Velander

This lab is fully equipped for protein characterization. In addition to standard equipment expected in any chemical or biomolecular lab, the following equipment is present:

- TEGs: Two computer-interfaced thromboelastographs (TEG 5000, Haemoscope Corporation, Inc.) for analyzing clot kinetics.
- Light Scattering Instrument: Computer-interfaced DynaPro Titan (Wyatt Technology Corporation) with a temperature-controlled microsampler and power unit.
- Freeze-drying Equipment: Centrivap Concentrator and Cold Trap (Labconco) and vacuum pump (Welch).
- Incubator: One incubator (VWR) maintained at 37°C.
- Freezers: One -20°C (VWR) and six -80°C (Thermo Electron Corporation) freezers.
- Centrifuges: Three centrifuges (Eppendorf, 5415D, 5804R and 5810R).
- UV/Vis Equipment: General purpose UV/Vis Spectrophotometer (Beckman Coulter, DU520).
- Plate Reader: Computer-interfaced plate reader (Beckman Coulter, AD340).
- General Lab Equipment: Several analytical balances (Denver Instruments), pH and conductivity meters, digital camera, light box, chromatography equipment, NANOpure Diamond water purification system (Barnstead), digital heat block(VWR), minivortexers (VWR) and two PowerPacs (BioRad).

Surface Science Laboratory
135 Othmer Hall
Dr. Henk Viljoen

Biomass Extraction and Separation Laboratory / Surface Design and Characterization
216 Othmer Hall
Dr. Yasar Demirel, Dr. Srivatsan Kidambi

Taylor Scientific Soxhlet Extraction 500 ml, Taylor Scientific Soxhlet Extraction 1000 ml, Taylor Scientific Cellulose Thimble 33x94 mm, Taylor Scientific Cellulose Thimble 43x123 mm, and a Taylor Scientific Heating Mantles-3-Place mantle.

Equipment

- Dip coater
- Optical microscope (upright)
- Spin coater
- Barnstead water purification
- UV/Vis spectrophotometer
- Ellipsometer
- Plasma cleaner

The William A. and Emily E. Scheller Chemical Engineering Biochemical Research Laboratory
218 Othmer Hall
Dr. Hossein Noureddini

Molecular Design of Catalysts and Nanomaterials Lab
219 Othmer Hall
Dr. Gustavo Larsen

Mesoscale Engineering Lab
227, 228, 232 Othmer Hall

Dr. Ravi Saraf

Bioseparations and Biomaterials Lab / Cell Culture

309 Othmer Hall

Dr. Anu Subramanian, Dr. Srivatsan Kidambi

This lab is currently under construction due to the recent hire of Srivatsan Kidambi.

Equipment

- CO2 incubator
- Biosafety cabinet
- Optical microscope (inverted)
- Freezers and fridge
- Plate readers

Unit Operations Laboratory (Emerson Plant Web)

15A Othmer Hall

The state-of-the-art Unit Operations Laboratory, which was completed in Spring 2005, provides our students with a hands-on chemical process experience. Laboratory equipment is used for the study of fluid mechanics, heat transfer, mass transfer, staged operations, process control, thermodynamics, reaction kinetics, and polymerization. The lab is equipped with a Delta V control system from Emerson Process Control and has a control room with five student workstations, a domain server and a historical server. On the floor of the lab are an additional two Delta V workstations. Equipment includes a continuous distillation column, batch distillation column, catalysis experiment with a mass spectrometer, double pipe flow experiment, and a gas chromatograph with a control computer with Lab View software

Richard L. and Carol McNeel Chemical & Biomolecular Engineering Computer Lab

201 Othmer Hall

The Department operates its own microcomputer facility with 28 student stations and one teacher station with an overhead projector, document camera and sound. Computers are equipped with the latest office and research software including: Microsoft Office, MathCad, MatLab, SciFinder, and Aspen. The Department proudly offers free printing to our students with a black laser printer which is networked to all computers. All students in the Department are given 24/7 key card access to the lab. The computer lab also doubles as a multi-media classroom.

Chemical & Biomolecular Engineering Design Studio

205 Othmer Hall

The Design Studio is the Department's primary classroom and features two student computers, one teacher station with an overhead projector, document camera and sound. The desks and chairs are mobile and the walls are covered 360° with dry erase boards making it a premier space to illustrate engineering equations. All students in the Department are given 24/7 key card access to the Design Studio and the space is used after hours for group projects. The 24/7 access extends to the adjacent AIChE Office and Reading Room (described below).

AIChE Student Chapter Office

206 Othmer Hall

The UNL AIChE Student Chapter's Office houses two computers designated for use by the student organization. It also offers break room amenities such as a couch, refrigerator, and microwave.

A new addition to the AIChE Office (Spring 2009) is a multi-media slideshow and video production station which is equipped with Adobe design software, a scanner and a full color printer. This station is an extension of the adjacent Design Studio, but allows for students to work without disrupting a class in session.

The Kenneth and Edna Anderson Reading Room
207G Othmer Hall

With the help of donated funds and books, the Department proudly has an extensive collection of chemical engineering literature available for free check-out by students and faculty. The Reading Room is also used for study, meetings, and the occasional social event. The room is open to students 24/7 with keycard access.

Department Office Suite
207 Othmer Hall

The home of the Department, the 207 Office Suite contains private faculty and staff offices, three reception desks, a multi-media capable conference room, copy/work room, file storage room, and a lobby for guests. Each faculty and staff is equipped with a desktop or laptop computer (sometimes both), and an individual printer. In addition, the suite shares a color laser printer and a high speed color scanner. The suite is horseshoe shape and encompasses the Reading Room (described above).

Graduate Student Offices
134, 214, 215, 217, 220 Othmer Hall

Each graduate student office is equipped with desks for 6-12 students. Each student is provided a desktop or laptop computer and each office has at least one shared printer.

24/7 Student Conference Room/Graduate Student Offices
209.1 Othmer Hall

Completed in Spring 2009, Room 209.1 is the Department's newest resource for undergraduate and graduate students. The space is divided in half and houses four private graduate student offices and a meeting room which seats six or more. All students in the Department are given 24/7 key card access to meeting room so that they may schedule impromptu research meeting and study sessions as needed.

6. Projected Expenses for a New PhD Instructional Program

Please refer to the next two pages.

	Number of PhD Students by Academic Year of Entry									
Budget year	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	**Total**
10-11	2	0	9	6	5					**22**
11-12		0	9	6	5	4				**24**
12-13			9	6	5	4	6			**30**
13-14				6	5	4	6	8		**29**
14-15					5	4	6	8	8	**31**

Chart assumes 5-year completion of program

The chart above shows the number of PhD students expected to cycle through the Department of Chemical and Biomolecular Engineering program as it increases acceptance of PhD students to a target of 8 per year.

The attached budget assumes no other changes. No raises have been calculated for any salaries at any level, including those of Graduate Research Assistants. No increases are assumed for operating expenses which are drawn from State, F&A and Foundation sources.

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Chemical and Biomolecular Engineering PhD Program

	(FY_2012_) Year 1		(FY_2013_) Year 2		(FY_2014_) Year 3		(FY_2015_) Year 4		(FY_2016_) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty											0	$0
Professional											0	$0
Graduate assistants [1]	21	$477,880	21	$477,880	21	$477,880	21	$477,880	21	$477,880	21	$2,389,400
Support staff											0	$0
Subtotal	21	$477,880	21	$477,880	21	$477,880	21	$477,880	21	$477,880	21	$2,389,400
Operating												
General Operating												$0
Equipment												$0
New or renovated space												$0
Library/Information Resources												$0
Other												$0
Subtotal		$0		$0		$0		$0		$0		$0
Total Expenses	21	$477,880	21	$477,880	21	$477,880	21	$477,880	21	$477,880	**21**	**$2,389,400**

[1] These expenses are not new expense but are reallocation of existing assistanships from the unified Engineering PhD program.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Chemical and Biomolecular Engineering PhD Program

	FY(_2012_) Year 1	FY(_2013_) Year 2	FY(_2014_) Year 3	FY(_2015_) Year 4	FY(_2016_) Year 5	**Total**
Reallocation of Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$441,000	$463,050	$486,203	$510,513	$536,038	$2,436,803
Other Funding						$0
1						$0
2						$0
3						$0
Total Revenue	$441,000	$463,050	$486,203	$510,513	$536,038	$2,436,803

[1] The tuition and fees do not represent new funding but are from tuition and fees normally received from the unified Engineering PhD program. The tuitions and fees are approximated based upon an assumed enrollment, number of credit hours generated per student per year and the revenue from each credit hour. For example, revenue for Year 1 is based upon the assumption that there will be 35 PhD students taking 18 credit hours per year at an average tuition and fees rate of $700 per credit hour resulting in a total revenue of $441,000. Revenue for Year 2 (and subsequent years) assumes a 5% combined yearly increase in student credit hour generation and average tuition and fees per credit hour resulting in a total revenue of $463,050.

Proposal for a New Instructional Program:

Ph.D. in Civil Engineering

Degree Program

Department of Civil Engineering

College of Engineering

University of Nebraska-Lincoln

Elizabeth G. Jones, Ph.D., Graduate Chair
UNL, Dept. of Civil Engineering

Civil Engineering Graduate Committee
Shannon Bartelt-Hunt, Ph.D.
Junke Guo, Ph.D.
Yong-Rak Kim, Ph.D.
Christopher Tuan, Ph.D.

March 28, 2011

I. Descriptive Information

A. **The name of the institution proposing the program:**
University of Nebraska-Lincoln

B. **The name of the program (major) proposed:**
Civil Engineering

C. **Degrees/credentials to be awarded graduates of the program (e.g., diploma, BA, MA, etc.):**
Ph.D.

D. **Other programs offered in this field by this institution**
Bachelor of Science in Civil Engineering
Masters of Science in Civil Engineering
PhD in Engineering with a specialty in Civil Engineering

E. **CIP code:**
14.0801

F. **Administrative units for the program (e.g., college, division, department, etc.)**
Department of Civil Engineering
College of Engineering

G. **Proposed delivery sites(s), and type(s) of delivery, if applicable**
University of Nebraska-Lincoln (Lincoln and Omaha campuses); Classroom & distance-based

H. **Date approved by governing board**

I. **Proposed date (term/year) the program will be initiated:**
Fall 2012

J. **Description, including credit hours and other requirements (program of study), and purpose of the proposed program**
This proposal is for a Doctor of Philosophy (PhD) degree in Civil Engineering. The PhD degree in any field provides a program of studies by which students become producers of new knowledge in their respective disciplines. The curriculum for this program will prepare researchers, professors, and other professional leaders with the skills, values, and intellectual rigor needed for the most advanced leadership and investigation in the study and practice of civil engineering.

Upon approval of this proposal, the necessary process to remove the existing specialty in Civil Engineering from the unified PhD program in Engineering will be initiated. Students enrolled in the unified PhD program in Engineering with a specialty in Civil Engineering at the time will be transferred into the new PhD in Civil Engineering.

The purpose of the PhD in Civil Engineering is to prepare students to be scholars in research-oriented universities and to educate those who aspire to be reflective leaders in government and private industry.

The curriculum, consistent with the requirements for a PhD at the University of Nebraska, will be developed for five core areas of study, each represented as a specialization under Civil Engineering major. These specializations correspond to those represented at the undergraduate and masters level as well as among the graduate faculty in Civil Engineering. In alphabetical order, these specializations are:

- environmental engineering,
- geotechnical and materials engineering
- structural engineering,
- transportation engineering, and
- water resources engineering.

The details of the curriculum can be found in Addendum B: Degree Information

II. Review Criteria

A. Centrality to Role and Mission

To be completed by College

B. Evidence of Need and Demand

1. Need for the program

Civil Engineering is considered to be the oldest engineering field. Civil engineering includes the planning, design, construction, maintenance, and operation of the critical infrastructure that surrounds us and is the underpinning of our society. America's critical infrastructure includes its roads, bridges, railroads, water and wastewater treatments plants, sewers, dams, canals, drainage and flood control, landfills and many other facilities. For over a decade, the American Society of Civil Engineers (ASCE) has published a report card on the condition of our critical infrastructure. Most recently, in 2009, America's critical infrastructure received a grade of "D". As noted in the executive summary of the 2009 report card, "The nation's infrastructure faces some very real problems that threaten our way of life if they are not addressed."

According to ASCE's infrastructure report card web site (www.infrastructurereportcard.org), the top three infrastructure concerns for Nebraska are:

- Roads
- Wastewater
- Bridges

Some key infrastructure facts for Nebraska are:

- 23% of Nebraska's bridges are structurally deficient or functionally obsolete
- Nebraska's drinking water infrastructure needs an investment of $1.35 billion over the next 20 years.
- 24% of Nebraska's major roads are in poor or mediocre condition
- 30% of Nebraska's major urban highways are congested.
- Vehicle travel on Nebraska's highways increased 39% from 1990 to 2007.

- Nebraska state transportation managers ascertain that the level of funding necessary to maintain the current system is $170 million.
- Nebraska has $1.31 billion in wastewater infrastructure needs.

With dwindling resources for addressing these problems and the need for critical infrastructure increasing as our population increases, the need for civil engineers with PhDs is essential to the state, the nation and the world. The skills and knowledge of civil engineers with PhDs include fundamental and advanced knowledge of infrastructure systems, the ability to create knowledge and better understanding of infrastructure challenges through research and critical thinking, the ability to effectively communicate to their research to the profession and promote the public understanding of infrastructure challenges and novel solutions, and the skills needed to educate future generations of civil engineers.

Not only is infrastructure used by all of us in our daily lives, but it is also well known to be crucial for economic development. Historically, infrastructure investment has been crucial to economic development in America. In our nation's earliest days, construction of canals and turnpikes, followed by construction of railroads in the first half of the nineteenth century, and then by the interstate highway system in the 1950s and 1960s, greatly increased the prospects for trade and development. Nebraska, home to Union Pacific and BNSF railroads as well as national trucking firms such as Crete Carriers and Werner Enterprises, has greatly benefited from our national investment in infrastructure.

Infrastructure also helps maintain public health. Around 1900, before water treatment with chlorination began, waterborne illnesses were rampant in countries with large populations. Today, they are still rampant in developing countries and countries struggling with war or inadequate governments. Worldwide, more than 5 million people die of waterborne or water-related diseases every year. Of these 5 million, less than 10 lived in the US. Water treatment plants in the US and Nebraska do much to prevent waterborne illness and improve public health.

Civil Engineering graduates, both those with PhDs and those educated by PhDs in Civil Engineering, go on to have successful careers in the public and private sectors as well as at universities. Our graduates are employed by many of the largest employers in the state of Nebraska including Union Pacific, BNSF, Crete Carrier, Werner Enterprises, Valmont Industries, Qwest, Mid-America Energy, Behlen Manufacturing, Kiewit, HDR, Olsson Associates, US Army Corps of Engineers, OPPD, NPPD, LES, Nebraska Department of Roads, Nebraska Department of Environmental Quality, MUD, City of Omaha, City of Lincoln, and other municipalities around the state. At least two UNL faculty members received their PhD in Civil Engineering from UNL (Dr. John Stansbury and Dr. Wayne Woldt) and have continued to help address local, state and national infrastructure needs and challenges through research and education of new civil engineers.

A PhD program in Civil Engineering is also important for UNL to maintain and increase its competiveness as a research intensive university. Within UNL's peer institutions (Colorado State University, Iowa State University, Ohio State University, Purdue University, University of Colorado-Boulder, University of Illinois-Urbana Champaign, University of Iowa, University of Kansas, University of Missouri-Columbia, and the University of Minnesota-Twin Cities), all

have a PhD program within their civil engineering department. Within the Big Ten conference, all of the schools with a civil engineering program have a PhD degree with a civil engineering major (University of Illinois, University of Iowa, University of Michigan, Michigan State University, University of Minnesota, Northwestern University, Ohio State University, Pennsylvania State University, Purdue University and University of Wisconsin-Madison). None of UNL's peer schools and none of the other civil engineering programs in the Big Ten use a unified PhD structure. The change from a unified PhD program to a Civil Engineering PhD program will help UNL compete in terms of research and education.

2. Demand for the program

The Department of Civil Engineering at the University of Nebraska-Lincoln (UNL) provides civil and environmental engineering education at the undergraduate and graduate levels, primarily to the citizens of Nebraska, but also to students from across the U.S. and from throughout the world. The Department offers graduate degrees leading to a Master of Science degree in Civil Engineering. The Department also offers a program leading to a doctoral degree in Engineering (Specialization: Civil Engineering) which is currently offered under the "Unified" doctoral program in Engineering. Departmental records indicate that the graduate program in Civil Engineering is over 100 years old.

The Department of Civil Engineering was established in 1877, when First Lieutenant Edgar S. Dudley, a Professor of Military Science and Tactics was asked by the University of Nebraska to create and teach a civil engineering program. Dudley was transferred in 1879 and his classes were assigned to other faculty members. In 1881, Charles N. Little was appointed as an instructor in "Mathematics and Civil Engineering." Mr. Little received his Ph.D. from Yale University in 1885. After completing his advanced studies, he was appointed as Associate Professor in charge of the Department of Civil Engineering. This event marked the official organization of the first engineering department at the University of Nebraska. In 1893, Oscar Van Pelt Stout became Associate Professor in charge of Civil Engineering. Professor Stout was awarded the first professional Civil Engineer degree in 1897. He later went on to become the second Dean of Engineering at the University of Nebraska from 1912 to 1919.

Most faculty members in the Department are engaged in research and creative activity in one of the five sub-discipline areas in the Department (Environmental Engineering, Geotechnical Engineering, Structural Engineering, Transportation Engineering, and Water Resources Engineering). Many of the research faculty are affiliated to some capacity with the Nebraska Transportation Center. Many faculty members are involved in cross-disciplinary research activities with other engineering and non-engineering departments and units on all three campuses of the University.

The demand for a PhD in Civil Engineering under the existing Unified PhD program has grown as shown in Table 1 and Figure 1 below. The Civil Engineering department has seen its PhD enrollments grow from 9 PhD students in 2003 to 43 students in 2010. As can be seen in Figure 1, the PhD student enrollment in the Civil Engineering specialty has shown good steady growth. We expect in the next two to three years to be at an enrollment of over 50 PhD students per year.

The Civil Engineering enrollments are supported primarily by research funding. In the last year, the Civil Engineering Department had research expenditures in excess of $6 million. We expect this level of research expenditures to continue and to grow.

Table 1 Enrollment in the Civil Engineering Specialty of the College of Engineering's Unified PhD Program – Fall 2003 through Fall 2010

Year	Enrollment
Fall 2003	9
Fall 2004	13
Fall 2005	20
Fall 2006	24
Fall 2007	33
Fall 2008	39
Fall 2009	40
Fall 2010	43

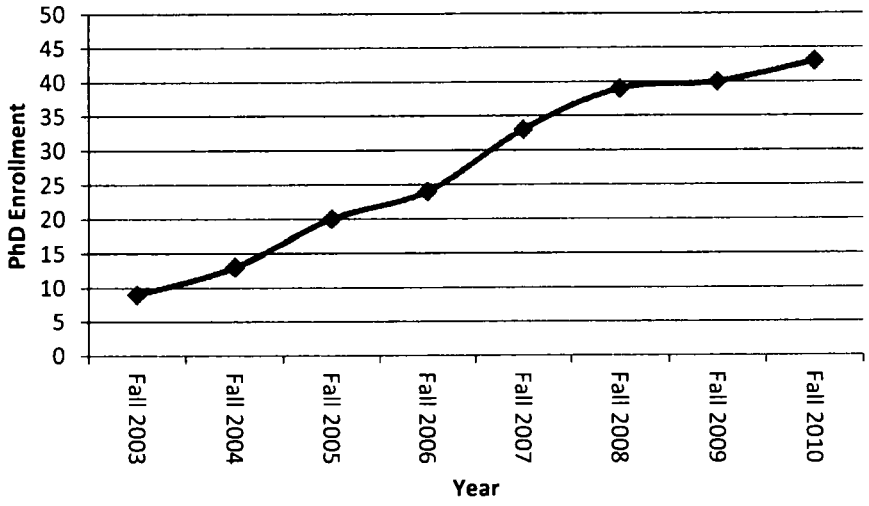


Figure 1 Enrollment in the Civil Engineering Specialty of the College of Engineering's Unified PhD Program – Fall 2003 through Fall 2010

Graduation from the Civil Engineering specialty of the College of Engineer's Unified PhD program has also continued to grow over the last several years as can be seen in Table 2 and Figure 2. In Figure 2, the annual number of graduates has been estimated at seven for the 2011 academic year. This estimate is based on where current PhD students are in their program and department performance for academic years 2009 and 2010.

Table 2 Graduation from the Civil Engineering Specialty of the College of Engineering's Unified PhD Program – AY 2003 through AY 2010

Academic Year	No. of Graduates
2003	6
2004	2
2005	1
2006	1
2007	2
2008	2
2009	8
2010	7
2011*	3

* Partial year – Fall 2010 graduates only

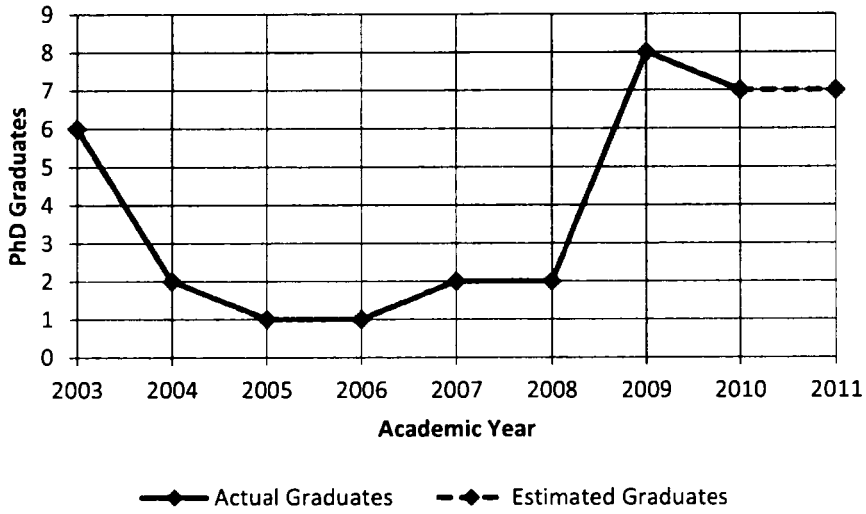


Figure 2 Graduation from the Civil Engineering Specialty of the College of Engineering's Unified PhD Program – AY 2003 through AY 2010, AY2011 estimated

We expect our enrollment and graduate numbers to stay at least at the levels seen from 2009 through present, if not rise. With twenty-five active graduate faculty in the Civil Engineering department, our PhD enrollment per faculty is currently 1.72 PhD students per faculty. We expect to see this rise to over 2.0 PhD students per faculty in the next two to three years. This would bring our enrollment to over 50 PhD students per year with an expected 10 PhD graduates per year.

The graduate numbers by academic year can also be expressed as five year average PhD graduation rates, which are shown in Figure 3 below. The graduation rate for the five year period of 2006-2011 includes the estimated graduation numbers for 2011 of 7 graduates, as was explained above. We expect our five year average PhD graduation rates to continue to increase to approximately 10 PhD graduates per year.

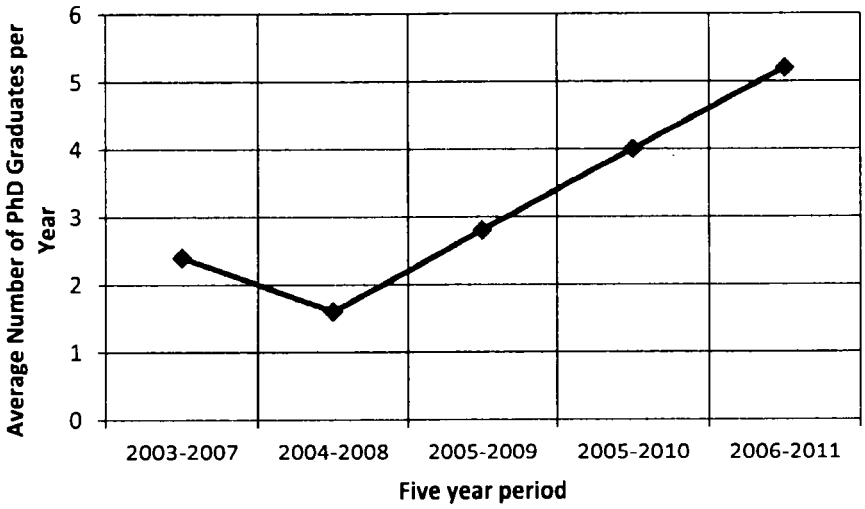


Figure 3 Five year average graduation rates for Civil Engineering PhDs

Thus, the history of the Department and the PhD student enrollment in the Unified PhD program with a major of Engineering and a specialty of Civil Engineering indicate a strong current and expected future demand for the PhD in Civil Engineering.

Background of PhD students in Civil Engineering

Most of the students working towards a PhD under the Unified PhD program have been from outside of the US. A survey of recently graduated and current PhD students in Civil Engineering indicate the following distribution of nationalities:

Brazil – 4
China – 21
Columbia – 1
Egypt – 5
Ghana – 1
India – 6
Iran – 9
Iraq – 1
Israel – 1
Jordan – 1
Libya – 1
Nepal – 4
Poland – 7
South Korea – 1
Taiwan - 1
Thailand – 2
USA – 11
Zambia – 1

Many of these students have studied at US institutions prior to starting their PhD work. The US universities represented by our PhD students include:

Clark Atlanta University
Florida A&M University
Florida International University
Iowa State University
North Dakota State University
Slippery Rock University
South Dakota State University
Texas A&M University
University of Idaho
University of Iowa
University of Massachusetts-Dartmouth
University of Nebraska at Omaha
University of Nebraska-Lincoln
University of South Dakota
University of Virginia
South Dakota School of Mines
Washington University (St. Louis)

Top international schools are also well represented by our recently graduated and current PhD students. These schools include the following international universities:

Indian Institute of Technology-Madras
Indian Institute of Technology-Bombay
Anna University-University of Madras, India
Osmania University
University of Tehran, Iran
Sharif University of Technology, Iran
Cairo University
Jordan University of Science and Technology
Politechnika Warszawska, Poland
TU Delft
University of Karlsruhe
Federal University – Ceara, Brazil
Federal University – Pernambuco, Brazil
Tribhuvan University, Nepal
Beijing Institute of Technology
Tsinghua University, China
Southwest Jiatong University
Dalian University of Technology
Tongji University
Hunan University
National Taiwan University
Harbin Institute of Technology
Nankai University

Placement of PhD graduates in Civil Engineering

All PhD graduates of the Civil Engineering specialty in the Unified PhD program have found ready employment in industry or universities both with the US and internationally. We have also had a couple of our PhD students continue on to law school at Washington University (St. Louis) and Stanford University.

C. Adequacy of Resources

1. Faculty and Staff Resources

The Civil Engineering Department has three staff members who support the graduate program. Pam Weise, located on the Lincoln campus, is the Graduate Secretary. She is assisted by Arlys Blakey on the Omaha campus and Jennifer Dush on the Lincoln campus.

The Civil Engineering Department has 27 graduate faculty members, 24 that are active, two that are emeriti faculty and one who's emeritus status is currently in process. The Civil Engineering graduate faculty are listed below in Table 3.

Table 3 Civil Engineering Graduate Faculty

Name	Rank	Area of Specialization
Admiraal, David M.	Associate Professor	Water resources
Bartelt-Hunt, Shannon	Assistant Professor	Environmental
Dahab, Mohamed F.	Professor	Environmental
Dvorak, Bruce I.	Professor	Environmental
Faller, Ronald K.	Research Assistant Professor	Structures
Guo, Junke	Assistant Professor	Water resources
Jones, Elizabeth G.	Associate Professor	Transportation
Khattak, Aemal	Associate Professor	Transportation
Kim, Yong-Rak	Associate Professor	Geotechnical & materials
Krause, Gary L.	Associate Professor	Structures
Li, Xu	Assistant Professor	Environmental
Li, Yusong	Assistant Professor	Water resources
Moussavi, Massoum	Associate Professor	Transportation
Nowak, Andrzej S.	Professor	Structures
Rohde, John	Associate Professor	Geotechnical & materials
Rilett, Laurence R.	Professor	Transportation
Sharma, Anuj	Assistant Professor	Transportation
Sicking, Dean L.	Professor	Structures
Stansbury, John S.	Associate Professor	Water resources
Szerszen, Maria	Associate Professor	Geotechnical & materials
Tuan, Christopher Y.	Professor	Structures
Zhang, Tian C.	Professor	Environmental
Azizinamini, Atorod	Emeritus Professor (pending)	Structures
Benak, Joseph V.	Emeritus Professor	Geotechnical & materials
Bogardi, Istvan	Emeritus Professor	Water resources
Moore, Raymond K.	Emeritus Professor (pending)	Geotechnical & materials
Tadros, Maher K.	Emeritus Professor (pending)	Structures

Curriculum vitae for Graduate Faculty of Civil Engineering are found in Addendum C.

2. Physical Facilities

The Civil Engineering Department maintains office space in Nebraska Hall and the Whittier Research Building in Lincoln and the Peter Kiewit Institute (PKI) Building in Omaha, and teaching and research laboratories in Nebraska Hall and the Scott Engineering Center on the Lincoln campus and in the PKI Building on the Omaha campus.

Office Space - Lincoln

The Civil Engineering Department main office, offices for faculty members not affiliated with the Nebraska Transportation Center, staff, and some graduate students are located on the first floor of Nebraska Hall. The office space quality is generally good.

Faculty associated with the Nebraska Transportation Center and their graduate students have offices in the Whittier Research Building. The office space quality is generally excellent.

Office Space - Omaha
On the Omaha campus, the Civil Engineering faculty and associate graduate students are housed in the PKI building on the South Campus of the University of Nebraska at Omaha. The office space quality is generally good to excellent.

Classroom Space – Lincoln
The Department maintains three classrooms in Nebraska Hall – two with a 55 seat capacity as well as one classroom/video conference room facility that can seat about 25 individuals. All classrooms are equipped with computer projection equipment and generally are in good condition. Distance education classrooms are shared with other programs in the College of Engineering.

Classroom Space – Omaha
The Department maintains a small (10 seat) video conferencing room in PKI to connect with the video conferencing equipment in Lincoln that is used to help support small graduate classes offered on both campuses by distance education. All other classrooms in PKI are shared among all programs housed in the PKI building. All classrooms are equipped with computer projection equipment and some are also equipped for distance education. All are generally in good to excellent condition.

Laboratory Space and Equipment - Lincoln
As indicated above, most of the teaching and research laboratories in Civil Engineering in Lincoln are located in the Scott Engineering Center (SEC). These laboratories include: 1) Structural Engineering (First floor bay area); 2) Water Resources Engineering (first floor bay area); 3) Geotechnical and Geomaterials Engineering (First floor), 4) Land Surveying (First floor area), and Environmental Engineering (Third floor). All of these laboratories are of sufficient space and quality and are used to support research and graduate education.

Laboratory Space and Equipment - Omaha
The Department of Civil Engineering maintains laboratory facilities in 1) Structural Engineering; 2) Geotechnical Engineering, 3) Environmental Engineering, 4) Transportation Engineering, and 5) Water Resources Engineering. All of these laboratories located in the PKI building are of sufficient space and quality and are used to support research and graduate education.

3. Instructional Equipment and Informational Resources

The instructional equipment consists of the classroom and laboratory facilities described above. All are adequate for supporting the existing PhD program under the current Unified PhD program and are expected to remain sufficient for the foreseeable future.

The Engineering Library, located in Nebraska Hall on the Lincoln campus, and the engineering resources located in the Criss Library on the Omaha campus have facilities, collections and services that have well supported the existing PhD program under the current Unified PhD program and are expected to remain sufficient for the foreseeable future.

4. Budget Projections

Nearly all of the current PhD students in Civil Engineering are supported through research grants and contracts. A few are supported by teaching assistantships to support undergraduate laboratory sections. This level of support for PhD students is expected to continue for the foreseeable future.

The existing staff in the Department has been able to well support the existing graduate programs, both MS and PhD. The change from the Unified PhD program to a Civil Engineering PhD program is not expected to require any additional staff support or time.

It is expected that the change from the Unified PhD program to a Civil Engineering PhD program can be delivered with the current staff levels and research support.

D. Avoidance of Unnecessary Duplication

To be completed by College

E. Consistency with the Comprehensive Statewide Plan for Postsecondary Education

To be completed by College

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Civil Engineering PhD Program

	(FY_2012_) Year 1		(FY_2013_) Year 2		(FY_2014_) Year 3		(FY_2015_) Year 4		(FY_2016_) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty											0	$0
Professional											0	$0
Graduate assistants [1]	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$1,084,155
Support staff											0	$0
Subtotal	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$1,084,155
Operating												
General Operating												$0
Equipment												$0
New or renovated space												$0
Library/Information Resources												$0
Other												$0
Subtotal		$0		$0		$0		$0		$0		$0
Total Expenses	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$216,831	11.6	$216,831	**11.6**	**$1,084,155**

[1] These expenses are not new expense but are reallocation of existing assistanships from the unified Engineering PhD program.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Civil Engineering PhD Program

	FY(_2012_) Year 1	FY(_2013_) Year 2	FY(_2014_) Year 3	FY(_2015_) Year 4	FY(_2016_) Year 5	**Total**
Reallocation of Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$201,600	$211,680	$222,264	$233,377	$245,046	$1,113,967
Other Funding						$0
1						$0
2						$0
3						$0
Total Revenue	$201,600	$211,680	$222,264	$233,377	$245,046	$1,113,967

[1] The tuition and fees do not represent new funding but are from tuition and fees normally received from the unified Engineering PhD program. The tuitions and fees are approximated based upon an assumed enrollment, number of credit hours generated per student per year and the revenue from each credit hour. For example, revenue for Year 1 is based upon the assumption that there will be 16 PhD students taking 18 credit hours per year at an average tuition and fees rate of $700 per credit hour resulting in a total revenue of $201,600. Revenue for Year 2 (and subsequent years) assumes a 5% combined yearly increase in student credit hour generation and average tuition and fees per credit hour resulting in a total revenue of $211,680.

Addendum B: Degree Information

1. Primary student learning outcomes of the proposed PhD degree in Civil Engineering

- *Fundamental Knowledge*: Graduates will command profound basic and applied knowledge in their specialty area within their specialization. This will be achieved through their coursework. Evaluation of this outcome will be through the qualifying exam.
- *Independent Abilities*: Graduates will have the ability to conduct a major independent and original research study that includes gathering of information, gaining an understanding of the process of academic or commercial exploitation of research results, demonstrating an understanding of contemporary research issues, effective project management, synthesis and evaluation, and appropriate dissemination of research findings. This outcome will be achieved through and evaluated using their dissertation research and publications resulting from the dissertation research.
- *Critical Thinking*: Graduates will have a profound ability to critique and synthesize literature, review results and to apply knowledge gained from literature to develop new ideas, to design and evaluate scientific investigations, and to assess, interpret and understand data related to their specialty area within their specialization. Evidence of this outcome is demonstrated in and evaluated using the comprehensive exam and the dissertation research.
- *Advanced Knowledge*: Graduates will demonstrate profound mastery of the subject matter at a deeper theoretical and applied level well beyond fundamental knowledge gained in the undergraduate course sequence and the higher-level knowledge gained in the master's level course sequence. Evidence of this will be demonstrated through the qualifying exam, the comprehensive exam and the final exam.
- *Effective Communication*: Graduates will have the ability to construct coherent arguments and articulate ideas clearly to an audience, through a variety of techniques, constructively defend research outcomes, justify their research to the profession and promote the public understanding of their research fields. This will be achieved through presentation and publication of the student's dissertation research.
- *Professional Development:* A student graduating with a doctoral degree in civil engineering is expected to demonstrate interest in pursuing life long learning by attaining professional licenses, and obtaining professional development hours by attendance at conferences, higher educational classes, short courses and seminars, conducting classes, and publishing. Periodic surveys of our graduates will be the method used to evaluate this outcome.

Program Assessment

The Civil Engineering Graduate Committee reviews the PhD program generally on an annual basis as to how well each of the learning outcomes are being achieved. Data on recruitment, retention and graduation rates, student evaluations of graduate courses, student performance data (outcomes of qualifying, comprehensive and final exams), graduate awards, external grants/fellowships, exit interviews, student placement data, and publication of dissertation research may all be used to assess the overall program and learning objectives.

The other form of review of the Civil Engineering PhD program is the UNL Academic Program Review.

2. Admission criteria and selection procedures for students seeking admission to the Civil Engineering PhD degree program

Admission criteria

Generally, applications for the Spring semester must be completed before the previous September 1, and for the Summer and Fall semesters must be completed before the previous February 1. Applications received after these deadlines will also be considered, however, funding decisions are generally linked to the stated deadlines. Formal and complete graduate application procedures for UNL are described in the Graduate Studies Bulletin.

The admission requirements for applicants to the Civil Engineering graduate programs require that each applicant show evidence to support their potential for scholarly success at the graduate level at the University of Nebraska-Lincoln. This evidence must include the following:

- Earned Bachelor's (or equivalent) degree in Civil Engineering or a related field
- Official transcripts from each college-level institution attended, listing courses completed and marks earned.
- Verification of English proficiency: If an applicant's native language is not English, the applicant will be required to demonstrate his/her ability to undertake advanced academic work in an English-speaking institution through English language proficiency tests such as the TOEFL. The minimum required TOEFL score for applicants to Civil Engineering is 550 for the paper-based exam and 80 for the internet-based exam. Exemptions for the English proficiency requirement are granted for non-native speakers who have received a bachelor's or more advanced degree either from a U.S. institution or from a university outside the U.S. at which English is the official language of instruction.
- Graduate Record Examination scores
- Other evidence of potential for scholarly success at the graduate level
    - Letters of recommendation
    - Statement of purpose
    - Resume or curriculum vitae

Exceptions to the admission requirements will be evaluated by the Graduate Committee on a case by case basis. The request for an exception must be submitted in writing to the Graduate Chair by the Graduate Committee member responsible for the application. The request for exemption must provide evidence to support the rationale for the exemption. Exemption requests will be reviewed at the next regularly scheduled Graduate Committee meeting following the receipt of the exemption request by the Graduate Chair. Exemptions will be granted only if a simple majority of the Graduate Committee approves the exemptions. All exemptions granted by the Civil Engineering Graduate Committee are subject to approval by the Office of Graduate Studies. If the Office of Graduate Studies does not approve the exemptions granted by the Civil Engineering Graduate Committee, the applicant cannot be admitted. Any applicant receiving an exemption from one or more of the admission requirements must be admitted provisionally and must complete, at a minimum, his/her first 9 credits of graduate work in Civil Engineering with a grade of "B" or better. Failure to complete the first 9 credits with a grade of "B" or better, in addition to

any other conditions specified, will result in the immediate termination of the student from the Civil Engineering graduate program.

Selection procedures

All applications will be reviewed by the Graduate Chair, by the Graduate Committee Member representing the applicant's stated discipline area, and should be reviewed by each faculty member in the applicant's stated discipline area. If no discipline area is stated by the applicant, the Graduate Chair should attempt to contact the applicant to determine the applicant's discipline area of interest. All faculty in the Civil Engineering department are welcome to review any and all graduate applications.

It is the responsibility of each committee member to ensure that all faculty within his/her discipline group have access to all graduate applications to their discipline. Additionally, each committee member should survey all graduate faculty members in his/her discipline group as to

- whether or not an applicant should be recommended for admission,
- whether or not the faculty member is interested in advising the applicant,
- whether or not the faculty member is interested in funding the applicant.

The decision to admit or not should be made based on this survey of the discipline faculty and must ensure that at least one graduate faculty member is willing to serve as the academic advisor for each applicant recommended for admission. For applicants without a discipline area of interest, the Graduate Chair should survey all graduate faculty in the Civil Engineering department as specified above.

A recommendation for admission for each applicant should be made by no later than three weeks after the application deadline or for applications received after the deadlines, no later than one month after the completed file has been sent for review to the Civil Engineering Graduate Committee.

The recommendation for admission for each applicant is made by the graduate committee member for the discipline area stated by the applicant. It is the responsibility of the discipline area graduate committee member to make his/her recommendation known to all of the faculty within his/her discipline at the time the committee member sends this information to the Graduate Chair. If a faculty member disagrees with the recommendation being made, he/she must make their objections known to their discipline area graduate committee member by e-mail within 2 working days of receiving the admission recommendation. Within 3 working days, the faculty making the objection and his/her discipline area graduate committee member should meet to resolve their disagreement. If the disagreement cannot be resolved, either or both can bring this disagreement to the Graduate Chair by e-mail within 2 working days of the meeting to resolve the disagreement. The Graduate Chair will serve as the arbitrator to resolve the disagreement and must inform the Department Chair of this disagreement within 2 working days of being notified of the disagreement.

The Graduate Chair reviews all recommendations for admission. If the Graduate Chair disagrees with a recommendation for admission, he/she must inform the Department Chair of this by e-mail within 5 working days of receiving the admission recommendation. The

Department Chair will serve as the arbitrator to resolve the disagreement between the Graduate Chair and the Graduate Committee member making the initial admission recommendation.

3. Coursework, research and other academic requirements for the Civil Engineering PhD degree

The graduate curricula consist of three elements:

i. Learning outcomes
ii. Coursework requirements
iii. Examination requirements

The learning outcomes are listed in Section 1 of this Addendum. The coursework requirements are given by specialization below. The examination requirements are also given below.

The Civil Engineering major has five specializations – environmental engineering, geotechnical and materials engineering, structural engineering, transportation engineering, and water resources engineering.

Coursework and Research Requirements

The minimum amount of graduate credit is 90 semester hours, including a dissertation. Up to 30 credits from a master's degree may be counted towards the PhD in Civil Engineering. The PhD program in Civil Engineering will normally include a minimum of 12 hours and a maximum of 55 hours of dissertation research. There is no uniform language or research tool requirement for the PhD in Civil Engineering.

Program of Studies

It is important that the coursework clearly support and are related to the area of research that will form the basis for the dissertation. A mismatch between the coursework and the dissertation research may significantly lengthen the time to complete the PhD degree. It is important that each student work closely with his or her supervising professor and supervisory committee to develop a Program of Studies that not only fulfills the coursework requirements described below but also supports the student's intended research work. A Program of Studies should be completed, approved by the student's supervisory committee and submitted to the Office of Graduate Studies prior to the completion of 36 hours of coursework and not later than the completion of 45 hours of coursework. Completion of a Program of Studies later than this may cause the student to be required to take additional courses beyond the typical amount of coursework for a PhD student and significantly delay the completion of the PhD degree.

Core Courses

Each discipline has a set of required core courses that they expect all students graduating with a PhD to have successfully taken. The specific coursework requirements vary by specialization as described below.

Environmental Engineering

Preparatory/Required Undergraduate Courses

Although an undergraduate degree in Civil Engineering is not required as a prerequisite to the PhD program in environmental engineering, students who do not have a BS in civil engineering will normally be required to complete those undergraduate courses that provide appropriate

background. Required undergraduate preparatory coursework will include mathematics through differential equations; a course in computer programming; 12 hours of chemistry, physics or geology courses, and 12 hours of engineering sciences courses including statics, fluid mechanics and 6 hours of coursework from the following courses (or their equivalent): ENGM 373 Engineering Dynamics, ENGM 325 Strength of Materials, CHME 332 Transport Operations I, PHYS 212, and ELEC 211

An introductory course in environmental engineering (CIVE 326 or equivalent), an introductory environmental engineering laboratory course (CIVE 327 or equivalent), and one additional 400-level environmental engineering course (such as CIVE 425 Environmental Engineering Process Design) will typically be required.

Required Graduate Core Courses (10 credit hours)
The following courses are required for completion of the PhD in environmental engineering. Students who have already taken these courses or equivalent courses will have an increased number of electives that they can take as part of their program.

CIVE 823 Physical/Chemical Treatment Processes, 3 cr
CIVE 828 Environmental Engineering Chemistry, 3 cr
CIVE 829 Biological Treatment Processes, 3 cr
ENVE 990 Seminar in Environmental and Water Resources Engineering, 1 cr

Elective Courses
Each student must also choose elective courses that provide appropriate depth and breadth to the student's program of study. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. A listing of relevant electives may be found below. Electives are not limited to this list, however.

Courses offered in the Department of Civil Engineering
CIVE 819 Flow Systems Design
CIVE 821 Hazardous Waste Management and Treatment
CIVE 822 Pollution Prevention: Principles and Practices
CIVE 824 Solid Waste Management Engineering
CIVE 826 Design of Water Treatment Facilities
CIVE 827 Design of Wastewater Treatment and Disposal Facilities
CIVE 830 Fundamentals of Water Quality Modeling
CIVE 831 Small Treatment Systems
CIVE 832 Bioremediation of Hazardous Wastes
CIVE 852 Water Resources Development
CIVE 854 Hydraulic Engineering
CIVE 856 Surface Water Hydrology
CIVE 858 Groundwater Engineering
CIVE 875 Water Quality Strategy (AGRO 875)
CIVE 898 Special Topics
CIVE 915 Water Resources Engineering
CIVE 916 Interdisciplinary Seminar in Engineering Economics and Legal Aspects of Water Resources Systems
CIVE 921 Advanced Topics in Hazardous Waste Treatment and Remediation

CIVE 926 Advanced Topics in Water Treatment
CIVE 927 Advanced Topics in Water Treatment
CIVE 952 Water Resources Planning
CIVE 954 Advanced Hydraulics
CIVE 955 Solute Movement in Soils (AGEN 955, AGRO 955)
CIVE 958 Groundwater Mechanics

Courses offered in the Department of Biological Systems Engineering
AGEN 853 Irrigation and Drainage Systems Engineering
AGEN 953 Advanced Irrigation and Drainage Systems Engineering
AGEN 954 Hydraulic Modeling of Small Watersheds
AGEN 955 Solute Movement in Soils (AGRO 955, CIVE 955)
BSEN 841 Animal Waste Management
BSEN 855 Nonpoint Source Pollution Control Engineering
BSEN 941 Agricultural Waste Management
BSEN 943 Bioenvironmental Engineering

Courses offered in the Department of Chemical Engineering
CHME 832 Transport Operations
CHME 835 Transport Phenomena
CHME 842 Chemical Reactor Engineering and Design
CHME 845 Advanced Chemical Engineering Kinetics
CHME 873 Biochemical Engineering
CHME 892 Air Pollution Assessment and Control

Geotechnical and Materials Engineering

Preparatory/Undergraduate core courses

Although an undergraduate degree in civil engineering is not required as a prerequisite to the PhD program in geotechnical-materials engineering, students who do not have a BS in civil engineering will normally be required to complete those undergraduate courses that provide appropriate background. Required undergraduate preparation would generally include mathematics (through calculus, geometry, and differential equations), an introductory course in statistics (e.g., STAT 380 at UNL) or an equivalent, and engineering mechanics (e.g., ENGM 325 and 373 at UNL). General introductory courses in geotechnical-materials (e.g., CIVE 334 and 378 at UNL) are also necessary. While 300 (junior)-level courses cannot count toward the program requirements, a limited number of 400 (senior)-level classes with a corresponding 800-level component (15 credits) can be counted.

Required core courses (12 credits)

Core courses (12 credits), listed below, provide exposure to the basic aspects of geotechnical-materials engineering. Students who have already taken such courses have an increased number of electives that they can take as part of their program.

CIVE 834 Soil Mechanics II (3 credits)
CIVE 836 Foundation Engineering (3 credits)
CIVE 872 Pavement Design and Evaluation (3 credits)
CIVE 851 Introduction to Finite Element Analysis (3 credits)

Students must either take the classes above or show that they have taken equivalent courses in their undergraduate program or in another graduate program.

Elective courses
Each student must also choose electives that provide depth in his/her chosen area of focus within geotechnical-materials engineering and/or appropriate breadth. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. Relevant electives are listed below but not limited to this.

Civil Engineering Electives
CIVE 835 Experimental Soil Mechanics
CIVE 840 Reinforced Concrete Design
CIVE 842 Structural Dynamics
CIVE 844 Structural Design and Planning
CIVE 848 Nonlinear Structural Analysis
CIVE 857 Applied Structural Analysis
CIVE 861 Urban Transportation Planning
CIVE 862 Airport Planning and Design
CIVE 863 Highway Geometrics
CIVE 864 Transportation Characteristics
CIVE 866 Transportation Planning and Economics
CIVE 867 Transportation Safety Engineering
CIVE 868 Bituminous Materials and Mixtures
CIVE 898 Special Topics in Civil Engineering (by permission of advisor only)
CIVE 998 Special Topics in Civil Engineering (by permission of advisor only)

Construction Management Electives
CNST 885 Construction Project Scheduling and Control
CNST 886 Construction Management Systems

Engineering Mechanics Electives
ENGM 801 Analytical Methods in Engineering I
ENGM 802 Analytical Methods in Engineering II
ENGM 847 Advanced Dynamics
ENGM 848 Advanced Mechanics of Materials
ENGM 850 Introduction to Continuum Modeling
ENGM 852 Experimental Stress Analysis I
ENGM 875 Vibration Theory and Applications
ENGM 880 Numerical Methods in Engineering Analysis

Statistics Electives
STAT 801 Statistical Methods in Research
STAT 802 Experimental Design
STAT 870 Multiple Regression Analysis

Mathematics Electives
MATH 814 Applied Linear Algebra
MATH 815 Modern Algebra with Applications

MATH 821 Differential Equations
MATH 822 Advanced Calculus
MATH 824 Introduction to Partial Differential Equations
MATH 827 Mathematical Methods in the Physical Sciences
MATH 830 Ordinary Differential Equations I
MATH 831 Ordinary Differential Equations II
MATH 840 Numerical Analysis I
MATH 842 Methods of Applied Mathematics I
MATH 843 Methods of Applied Mathematics II

Minor
All geotechnical-materials engineering PhD students are encouraged but not required to have a minor in a closely related discipline. Minors selected by previous students include Engineering Mechanics, Construction Management, Statistics and Mathematics.

Structural Engineering
Preparatory/Undergraduate core courses
Although an undergraduate degree in civil engineering is not required as a prerequisite to the PhD program in structural engineering, students who do not have a BS in civil engineering will normally be required to complete those undergraduate courses that provide appropriate background. Required undergraduate preparation would generally include mathematics through differential equations and an introductory course in statistics (e.g., STAT380 at UNL) or an equivalent. A general introductory course in structures (e.g., CIVE 341 at UNL) and one in a specific area (i.e., reinforced concrete design, steel design, and structural analysis) are also desirable. While 300 (junior)-level courses cannot count toward the program requirements, a limited number of 400 (senior)-level classes with a corresponding 800 -level component (15 credits) can.

Required basic core courses
Basic/core courses (9 credits), listed below, provide exposure to the various aspects of structural engineering (the 800-level analysis and design classes). Students who have already taken such courses have an increased number of electives that they can take as part of their programs.
CIVE845 Structural Analysis III or CIVE851 Introduction to Finite Element Analysis (3 credits)
CIVE846 Steel Design II (3 credits)
CIVE847 Reinforced Concrete Design II or CIVE850 Prestressed Concrete (3 credits)

Students must either take the classes above or show that they have taken equivalent courses in their undergraduate program or in another graduate program.

Elective courses
Each student must also choose electives that provide depth in his/her chosen area of specialization within structural engineering and/or appropriate breadth. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. Relevant structures electives are listed below. Electives are not limited to this list, however.

CIVE842 Structural Dynamics (3 credits)
CIVE848 Nonlinear Structural Analysis (3 credits)

CIVE849 Reinforced Masonry Design (3 credits)
CIVE857 Applied Structural Analysis (3 credits)
CIVE940 Behavior of Steel Members (3 credits)
CIVE941 Behavior of Reinforced Concrete Members (3 credits)
CIVE942 Structural Systems in Steel (3 credits)
CIVE943 Structural Systems in Reinforced Concrete (3 credits)
CIVE944 Behavior of Miscellaneous Structural Materials (3 credits)
CIVE945 Structural Design for Dynamic Loads (3 credits)
CIVE946 Advanced Structural Engineering (3 credits)
CIVE947 Design of Thin Shell Structures (3 credits)
CIVE948 Blast-resistant Structural Design (3 credits)
CIVE949 Bridge Design (3 credits)

Minor
All structural engineering PhD students are encouraged but not required to have a minor in a closely related discipline. Minors selected by previous students include Mathematics, Engineering Mechanics, and Construction Engineering/Management.

Transportation Engineering
Preparatory/Undergraduate core courses
Although an undergraduate degree in civil engineering is not required as a prerequisite to the PhD program in transportation engineering, students who do not have a BS in civil engineering will normally be required to complete those undergraduate courses that provide appropriate background. Required undergraduate preparation would generally include mathematics through differential equations and an introductory course in statistics (e.g., STAT380 at UNL) or an equivalent. A general introductory course in transportation (e.g., CIVE 361 at UNL) and one in a specific area (i.e., traffic engineering, highway design, and transportation planning) are also desirable. While 300 (junior)-level courses cannot count toward the program requirements, a limited number of 400 (senior)-level classes with a corresponding 800 -level component can (15 credits) can.

Required basic core courses
Basic/core courses (9 credits), listed below, provide exposure to the various aspects of transportation and background in applied statistics (implicit in the 800-level transportation classes). Students who have already taken such courses have an increased number of electives that they can take as part of their program.
CIVE861 Urban Transportation Planning (3 credits)
CIVE862 Highway Design (3 credits)
CIVE863 Traffic Engineering (3 credits)

Students must either take the classes above or show that they have taken equivalent courses in their undergraduate program or in another graduate program.

Required core courses
In addition to the required courses above (traffic engineering, transportation planning, and highway design), PhD students are also required to take the three following courses for a total of nine (9) credits. These courses provide more depth in key areas.
CIVE864 Analysis & Estimation of Transportation Demand (3 credits)

CIVE865 Highway Geometrics (3 credits)
CIVE866 Transportation Characteristics (3 credits)

In addition to the three courses above, all PhD students are required to take the following:
STAT801 Statistical Methods in Research (4 credits)
CIVE989 Transportation Seminar (1 credit)

Students must either take the classes above or show that they have taken equivalent courses in another graduate program.

Elective courses
Each student must also choose electives that provide depth in his/her chosen area of specialization within transportation and/or appropriate breadth. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. Relevant transportation electives are listed below. Electives are not limited to this list, however.
CIVE867 Transportation Safety Engineering (3 credits)
CIVE868 Airport Planning & Design (3 credits)
CIVE869 Computer-aided Interchange Design (3 credits)
CIVE961 Mass Transit Systems (3 credits)
CIVE962 GIS in Transportation (3 credits)
CIVE963 Highway Safety Data Analysis (3 credits)
CIVE964 Theory of Traffic Flow (3 credits)
CIVE965 Traffic Control Systems (3 credits)
CIVE966 Transportation Planning & Economics (3 credits)
CIVE967 Analysis & Design of Transportation Supply Systems (3 credits)

Minor
All transportation PhD students are encouraged but not required to have a minor in a closely related discipline. Minors selected by previous students include Statistics and Computer Science & Engineering.

Water Resources Engineering
Preparatory/Undergraduate Core Courses
Although an undergraduate degree in Civil Engineering is not required as a prerequisite to the PhD program in Civil Engineering with a specialization in Water Resources Engineering, students who do not have a BS in Civil Engineering will be required to complete those undergraduate courses that provide appropriate background for PhD study in Water Resources Engineering. Required undergraduate preparation would include:

- all of the mathematics required in the Civil Engineering undergraduate program (i.e., mathematics through differential equations),
- all physics required in the Civil Engineering undergraduate program
- engineering statics
- engineering dynamics
- an introductory course in statistics
- fluid mechanics

- an introductory course in water resources engineering

Required Core Courses
Core courses provide exposure to the various aspects of water resources engineering. Students must take the courses listed below or demonstrate that they have taken sufficient course-work to cover the material in these courses:
CIVE 854 Hydraulic Engineering (3 credits)
CIVE 856 Surface Water Hydrology (3 credits)
CIVE 858 Groundwater Engineering (3 credits)
ENVE 990 Seminar in Environmental Engineering (1 credit)

Elective Courses
Students must chose electives that provide depth and breadth in a chosen area of specialization within water resources engineering. These courses are to be selected in conjunction with, and approved by the student's faculty advisor and supervisory committee. A partial list of relevant water resources electives are listed below:
CIVE 819 Flow Systems Design (3 credits)
CIVE 830 Fundamentals of Water Quality Modeling
CIVE 852 Water Resources Development
CIVE 855 Nonpoint Source Pollution Control Engineering
CIVE 875 Water Quality Strategy
CIVE 898 Special Topics
CIVE 915 Water Resources Engineering
CIVE 916 Interdisciplinary Seminar in Engineering: Economic and Legal Aspects of Water Resources Systems
CIVE 952 Water Resources Planning
CIVE 954 Advanced Hydraulics
CIVE 955 Solute Movement in Soils
CIVE 958 Groundwater Mechanics
CIVE 959 Groundwater Modeling
AGEN 853 Irrigation and Drainage Systems Engineering
AGEN 953 Advanced Irrigation and Drainage Systems Engineering
AGEN 954 Hydraulic Modeling of Small Watersheds
AGEN 955 Solute Movement in Soils

Examination Requirements
All specializations have a qualifying exam requirement in addition to the comprehensive and final exam requirements. These exams are described below.

Qualifying Examination
The Department of Civil Engineering gives a Ph.D. qualifying exam to doctoral students with the dual purposes of: 1) identifying any admitted doctoral students who seem not to be qualified for doctoral studies in terms of either technical competence or aptitude for research, and 2) identifying weaknesses in student preparation that should be remedied by taking appropriate course work. It is understood that identification of an unqualified student should be rare, and that it may be considered to reflect a deficiency in the admissions process.

The qualifying exam must be taken within the first year of a student's PhD program (generally within the first 20 hours of graduate course work, not including transfer credits). Delays are approved only in unusual circumstances, such as a student who spends the first semester taking only or primarily undergraduate prerequisite courses or English language proficiency courses. Generally the exam is given two times per year. The graduate faculty of each specialty will announce to all students needing to take the qualifying exam the scheduled date of the qualifying exam at least four weeks in advance of the exam.

Each specialization gives a qualifying examination specific to students in that specialization. The format of all qualifying exams is the same. The student first sits for an eight-hour written exam that is followed approximately three weeks later by an oral exam. The oral exam is approximately two hours in length. It is expected that the qualifying exam for each specialty will be administered by the graduate faculty members in that specialization.

There are generally three possible outcomes for any given student who is taking the qualifying exam for the first time:

1) Unqualified pass,
2) Pass with the qualification that certain courses must be taken to remedy deficiencies in background preparation, and
3) Failure, with the option of retaking the exam one semester later, or at an alternate date mutually agreed upon by the student and the faculty. A failure on the second attempt is considered final and the student is removed from the graduate program.

A decision about the student's success or failure on the qualifying exam is made based on the student's performance on the written and oral exams.

Comprehensive Examination

When a student has substantially completed studies in the doctoral program, he/she must pass a written and oral comprehensive examination, in major and minor or related fields. The written comprehensive examination is not a repetition of course examinations but is an investigation of the student's breadth of understanding of the field of knowledge of which his/her special subject is a part.

For all specializations in Civil Engineering, the comprehensive exam consists of a written portion and an oral portion. The written exam includes at a minimum a written dissertation proposal. The oral component may include the minor or related fields in addition to the major field of study.

The comprehensive exam is administered by the student's Supervisory Committee. The student will provide each member of their Supervisory Committee with a copy of the dissertation proposal at least two weeks before the exam date.

During the oral portion of the exam the student will provide a 20 minute presentation on their proposed topic. The presentation will be followed by questioning by the graduate committee. It is anticipated that the total time for the exam will be approximately 2 hours.

There are three possible outcomes for any given student who is taking the comprehensive exam for the first time:

1) Unqualified pass,
2) Pass with the qualification that the student work with their advisor to adjust the proposal, and
3) Failure, with the option of retaking the exam at an alternate date mutually agreed upon by the student and the faculty. Typically the maximum date will be six months from the date of the original exam. A failure on the second attempt is considered final. The student will either be asked to leave the graduate program or to find another dissertation topic.

A decision about the student's success or failure on the qualifying exam is made based on the student's performance on the written and oral exams.

When the student has passed the comprehensive examination and removed any provisional admission requirements, the student's supervisory committee will recommend to the Office of Graduate Studies the doctoral student's admission to Candidacy by filing the Application for Admission to Candidacy for the doctoral degree, noting the dates of completing the comprehensive examination.

Final Examination

The final examination for the doctoral degree is oral and open to members of both the University community and the public. During the dissertation presentation and general questioning all persons may be present. However, at the end of the public hearing there will be a closed questioning portion of the examination where all persons except the Candidate, doctoral supervisory committee, and invited faculty must be excused. It is given by the supervisory committee after the Candidate's studies have been completed and the dissertation accepted. The committee also determines its character and length. The examination may be devoted to the special field of the dissertation or to the Candidate's general knowledge, or it may be designed to test judgment and critical powers.

The final oral examination for the PhD will not be scheduled unless a majority of the supervisory committee, including the chair, are available for the examination. Exceptions may be made only by permission of the Dean of Graduate Studies. In any event, the supervisor of the dissertation must have seen and approved the completed dissertation before the examination will be scheduled.

The final oral examination over the dissertation may be waived only with the consent of the Graduate Dean. The committee reports the results of the final oral examination to the Office of Graduate Studies.

In the event that members of an oral examining committee are not unanimous regarding passing a Candidate, the student is to be approved for the degree if only one examiner dissents. However, in each case, the dissenting member of the committee will be expected to file a letter of explanation in the Office of Graduate Studies.

If a student fails to pass the final oral examination for an advanced degree, his/her committee must file a report on the failure in the Office of Graduate Studies and indicate what the student must do before taking another examination. Another examination may not be held during the same semester or the same summer session in which the student failed.

Dissertation Requirements

The dissertation is of no fixed length. It should treat a subject from the Candidate's special field, approved by the supervisory committee. It should show the technical mastery of the field and advance or modify former knowledge, i.e., it should treat new material, or find new results, or draw new conclusions, or it should interpret old material in a new light. Each candidate for the degree shall submit with the dissertation an abstract of the same, not exceeding 350 words in length including the title. A guidebook for dissertation preparation is available on the Office of Graduate Studies Web site. For specific formatting guidelines, the Guidebook should be consulted.

Summary of Coursework, Research and Examination Requirements

The PhD degree in Civil Engineering should ordinarily take no more than five years to complete. While individual circumstances will vary, a typical timeline will be as follows:

Year 1 (0-21 credits): Coursework and qualifying examination
Year 2 (22-42 credits): Coursework, preliminary research, supervisory committee selection, submission of Program of Studies
Year 3 (43-63 credits): Coursework, preliminary research, comprehensive exam
Year 4 (64-84 credits): Research
Year 5 (85 or more credits): Research, completion of dissertation, final oral examination

Evaluation of Students

Each graduate student in the Civil Engineering PhD program should be evaluated on an annual basis to assess their academic progress, performance, and professional potential. This evaluation is the responsibility of the supervising professor. When evaluations are conducted, a written summary of the evaluation is prepared by the supervising professor and given to the student. A copy of the written evaluation is placed in the student's academic file and another copy is forwarded to the Graduate Chair for his or her review.

4. Policy and procedures for assigning advisors for the Civil Engineering PhD degree program

Supervising Professor/Academic Advisor

The Civil Engineering Graduate Committee provides oversight of academic advising for current graduate students. All Civil Engineering graduate students must have a Civil Engineering graduate faculty member as their academic advisor, including those Civil Engineering students funded by faculty from another department. Upon admittance to the Civil Engineering department's graduate program each graduate student is assigned a personal academic advisor. The academic advisor is assigned based on the survey of Civil Engineering faculty regarding the admission of an applicant. If more than one faculty member has agreed to be the advisor for an applicant, the graduate student's initial temporary academic advisor will be the graduate committee member for the graduate student's discipline. The newly admitted graduate student will then visit with all faculty expressing interest in advising the student, and the student will select their advisor from the Civil Engineering faculty expressing interest in advising the student. All newly admitted graduate students with a choice of academic advisors must choose their academic advisor by no later than the end of the second week of the semester to which they are admitted.

Supervisory committee

Each graduate student admitted to the doctoral program must form a supervisory committee in consultation with their supervising professor. The supervisory committee for any doctoral student should be formed prior to the completion of 36 hours of coursework and not later than the completion of 45 hours of coursework.

The committee will consist of at least four Graduate Faculty. The majority of the committee members are expected to be Civil Engineering Graduate Faculty members. At least one Graduate Faculty member external to the academic department or area in which the doctorate is to be granted must be included on the committee responsible for supervising the student's doctoral program of studies. The representative of the minor department on the committee may serve as the outside representative. All faculty on the supervisory committee must either be on the Graduate Faculty, or be non-Graduate Faculty approved to perform specified Graduate Faculty duties.

5. Policy and procedures for developing and approving specializations within the Civil Engineering PhD degree program

Five specializations are established for the Civil Engineering PhD program. These are:

- Environmental Engineering
- Geotechnical and Materials Engineering
- Structural Engineering
- Transportation Engineering
- Water Resources Engineering

To establish a new specialization, at least three graduate faculty members in Civil Engineering must unanimously agree to serve as the faculty for the specialization, and agree on the name of the specialization, the learning outcomes, and the coursework, research and other academic requirements for the specialization. The responsible faculty must develop a proposal for this specialization that is presented for consideration of the entire graduate faculty of Civil Engineering. The specialization is approved by the graduate faculty of Civil Engineering by a majority vote of all Civil Engineering graduate faculty members. PhD specializations approved by the Civil Engineering faculty are then routed per the requirements of UNL's Office of Graduate Studies.

6. National guidelines or accreditations

The PhD in Civil Engineering does not have national guidelines or accreditations.

Description of the Proposed Computer Engineering Ph.D. Program

Department of Computer Science & Engineering
Department of Electrical Engineering

1. Justification for The Program

Computer Engineering, as a discipline, grew out of overlapping topics in Computer Science and Electrical Engineering and is now well established at both the graduate and undergraduate levels. According to the Taulbee Survey, in 2008-2009, a total of 1543 BS, 923 MS and 177 PhD degrees were awarded in Computer Engineering, The total enrollment in the PhD program during the same year was 1507[1]. While the core of computer engineering relates to Computer Science and Electrical Engineering, the field is dynamic and beginning to encompass other engineering disciplines. For example, today precursors of cyber-physical systems (CPS), featuring a tight combination of, and coordination between their computational and physical elements, can be found in aerospace, automotive, and chemical domains. As such cross-disciplinary areas evolve, we expect participation in this field to include other departments at UNL.

In proposing this field-based PhD program, we were motivated by four primary considerations. First, there is a significant critical mass and research strength among the faculty in the Department of Computer Science and Engineering (CSE) and Electrical Engineering Department (EE), whose expertise fully covers the area of computer engineering. Second, the two departments share the CE undergraduate program in Lincoln that has been very successful and ABET accredited for fourteen years. Third, the recent academic program review for EE stated that, given the joint undergraduate CE program, EE would benefit from participating in the CE graduate program. Finally, there is a greater demand from applicants to enter our PhD program in Computer Engineering. Many of them apply to our PhD program in Computer Science and they are better served and are a better fit in a PhD (CE) program.

All of the faculty members listed in Section 3.a. are active in doctoral supervision and work in research and teaching areas closely related to the Computer Engineering field. In the past 5 years, they have collectively graduated 32 PhD students, published 116 journal papers and 272 peer reviewed conference papers and average over 6.8 million dollars in active grants.

Currently, we offer a field based PhD program in Computer Engineering under the Unified PhD (Engineering) program. Our proposal is to move it from under the unified PhD umbrella to a separate PhD program. Thus this is merely a replacement of an existing program and hence does not create any additional duplication.

2. Faculty

Currently 22 faculty members from CSE and EE are listed as members of this field based PhD program. We expect one more CSE faculty will be added to the list at the end of the current

[1] http://www.cra.org/govaffairs/blog/wp-content/uploads/2010/03/CRATaulbee-2010-ComputingDegreeandEnrollmentTrends.pdf

faculty recruiting season. They are listed below and their CVs are attached as Appendix A (CSE) and B (EE):

CSE Department

1. Sharad Seth (VLSI design for testability)
2. Byrav Ramamurthy (Computer Networks and Telecommunications)
3. Steve Goddard (Cyber-physical systems; Embedded systems and mobile robots)
4. Hong Jiang (Architecture and embedded systems, Storage systems)
5. Witty Srisa-An (Cyber-physical systems, embedded systems)
6. Mehmet Can Vuran (Wireless sensor networks, cross-layer design)
7. Jitender Deogun (Optical networks, optical devices)
8. Ying Lu (Real-time and embedded computing)
9. Berthe Choueiry (CE applications)
10. Lisong Xu (Computer Networking Protocols & Architectures)
11. Carrick Detweiler (Sensor networks, multi-robot systems)
12. Ashok Samal (Image Analysis)
13. David Swanson (High Performance Computing)

EE Department

1. Senem Velipasalar (Video/Image and Distributed processing)
2. Hamid Vakilzadian (Modeling and simulation of digital systems)
3. Sina Balkir (Analog, Digital, and RF VLSI design)
4. Cenk Gursoy (Communication and Networking)
5. Lance Perez (Communication and Assisted Living Technologies)
6. Khalid Sayood (BioInformatics and Data Compression) (non-voting)
7. Jerry Varner (Biomedical Signal Processing)
8. Michael Hoffman (Signal Processing)
9. Wenbo He (Cyber-Physical Systems, Networked Embedded Systems)

The chair of each department will select a departmental representative to coordinate admissions and operations related to the field and the representative from CSE will serve as the Chairperson of the field on the Graduate Board.

The program will be managed from the Department of Computer Science and Engineering. The staff that currently supports the PhD program includes secretarial staff that manages the application and programmatic aspects and system administration staff that manages computing facilities and instructional and research laboratories. The same staff will be available to support the stand-alone PhD program.

3. Students

The Department of Computer Science and Engineering has offered a standalone PhD program in Computer Science since 1984. The current PhD (Engineering) with Computer Engineering specialization has been in place since 1978. In the last 5 years, the CSE Department has graduated 51 students in its PhD program. Many of our applicants with engineering

background, who currently apply to the CS PhD program would be better served by the stand-alone Computer Engineering PhD program. We list the 24 students in the past 5 years who graduated with PhD is Computer Science, but whose dissertations fit better in a PhD in Computer Engineering. This is more indicative of the capacity of the PhD in Computer Engineering when it is granted standalone status.

Student Name	Advisor Name	Pre-PhD Ed	Dissertation Title	Graduation Date	Affiliation
Xin Liu	Goddard	B.E. (CS) M.E. (CS)	Dynamic Quality of Service in an Open System	Aug. 2004	Assis Prof. CST, CoIET, BIT
Xi Yang	Ramamurthy	B.E. (CS) M.E.(CS)	Efficient Design and Operation of Translucent Optical WDM Networks	Aug. 2004	Rsch Sci'st USC/ISI-East
Nader Mohamed	Jiang	B.S.(EE) M.S. (CS)	Design And Analysis of Communication Middleware for Multiple Network Interfaces	Aug. 2004	Assoc. Prof UAEU, UAE
Xiao Qin	Jiang	B.E. (CE) M.E. (CE)	Dynamic I/O-Aware Load Balancing and Resource Management for Clusters	Aug. 2004	Assoc. Prof. Auburn U.
Yifeng Zhu	Jiang	B.E. (EE) M.E. (EE)	Cluster-based storage systems with high scalability	Aug. 2005	Assoc. Prof. ECE, UMaine
Wang Yao	Ramamurthy	B.E. (CE) M.E. (CS)	Traffic Grooming in Next-Generation Optical WDM Mesh Networks	Aug. 2005	Blade Network Tech.
Mengke Li	Ramamurthy	B.E. (CS) M.E. (CS)	Cost-Efficient Design of Waveband Switching in Optical Wavelength Division Multiplexed Networks	Dec. 2005	Engineer Microsoft
Ahmed Mahdy	Deogun	B.S. (EE) M.S. (CS)	A broadband infrastructure for ad hoc networks with optical wireless	May 2005	Texas A&M @ Corpus Christi
Sheng Zhang	Seth	B.S.(Phy) M.S.(Phy)	Built-In Self-Test Design Optimization For Scan-Based Circuits	Oct. 2006	Sr. Sci'ist, Broadcom
Lu Shen	Ramamurthy	B.E. (CE) M.E. (CE)	Resource Allocation in Wavelength-Routed WDM Mesh Networks	May 2006	Juniper Networks
Ajay Kumar Todimala	Ramamurthy	B.S. (CE) M.S. (CE)	Fault-tolerance using Shared Path Protection in Wavelength Division Multiplexing Optical Transport Networks	Dec. 2006	AT&T Labs-Research
Hui Cheng	Goddard	B.E. (CE) M.E. (CE)	Energy-Efficient Scheduling Algorithms For Real-Time Systems	Aug. 2006	Engineer Microsoft
Hailong Cai	Wang	B.E. (CS) M.S. (CS)	Content Location and Routing Information Caching in P2P Systems	Aug. 2006	Engineer Google
Haitham S. Hamza	Deogun	B.S. (EE) M.S. (CS)	Nonblocking WDM optical switching networks: Design and analysis of new classes	May 2006	Assis. Prof. Cairo Univ. Egypt
Xuli Liu	Jiang & Soh	B.S. (CE) M.S. (CS)	APOP: An Automatic Pattern- and Object-based Code Parallelization Framework for Clusters	May 2007	Assis. Prof. CSIS, UNK
Sumanth J. Venkata	Jiang & Swanson	B.E. (CE) M.S.(CE)	Efficient Adaptive Load Balancing of Many-Body Molecular Dynamics Simulations in Dynamic Heterogeneous Distributed Environments	May 2007	Sr. FW Engineer, Seagate
Yijun Lu	Jiang &	B.E. (CS)	Improving Data Consistency Management and	Aug. 2007	Sr. SW

	Lu	M.E.(CS)	Overlay Multicast in Internet-scale Distributed Systems		Engineer Amazon
Jian Kang	Seth	B.E.(CE) M.E.(CE)	On Reusing Functional Tests in Manufacturing Testing	Dec. 2007	Test Engrr, Intel
Yong Wang	Ramamurthy	B.S. (CE) M.S. (CE)	Key management protocols for Hybrid Wireless Sensor Networks	Dec. 2007	Calient Networks
Xiaoyu Yao	Wang	B.E. (CS) M.E. (CS)	Improving Energy Efficiency and Performance in Storage Server Systems	May 2007	Engineer Microsoft
Ala' Qadi	Goddard	B.S. (EE) M.S. (CE)	Dynamic Processing Windows for Mobile Robotic Real-Time Systems	Aug. 2008 (CE)	Post-doc Carleton U. .Ottawa, Canada
Feng Xian	Srisa-An & Jiang	B.E. (CS) M.E. (CS)	VM-aware thread scheduling framework: improving efficiency of java runtime environments	May 2008	Engineer Microsoft
Jie Feng	Xu	B.E. (CS) M.E. (CS)	Stochastic TCP Friendliness: Exploring the Design Space of TCP-Friendly Traffic Control in the Best-Effort Internet	Aug. 2009	Engineer Epic Systems
Yuyan Xue	Ramamurthy & Vuran	B.E. (CS) M.S. (EE)	Service-Differentiated and Reliable Communication in Event-Based Wireless Sensor Networks	May 2010 (CE)	Microsoft

Current PhD Students in Computer Engineering: Currently there are 9 PhD students in the Computer Engineering program under the Unified PhD in Engineering and possibly four more joining in Fall 2011. They are listed below:

- Benjamin Christensen, Advisor: Can Vuran.
- Xin Dong, Advisor: Can Vuran.
- Jian Hu, Advisor: Hong Jiang.
- Mai Ren, Advisor: Wenbo He.
- Yutaka Tsutano, Advisor: Witty Srisa-An.
- Hongwei Wang, Advisor: Wenbo He.
- Lei Xu, Advisor: Hong Jiang.
- Dongyuan Zhan, Advisors: Hong Jiang/Sharad Seth.
- Yi Pan, Advsor: Byrav Ramamurthy (Spring 2011)

4. Description of The Curriculum

The program features including admission requirements, curriculum structure, examination formats and supervisory committee organization are described below. These remain unchanged from the current features.

Admission Requirements

The candidate must meet the following minimum prerequisites for admission to the program:

- A Bachelor Degree in Computer Engineering, Electrical Engineering, Computer Science, or another closely related area.
- A GPA of at least 3.0 on a 4.0 scale (B average or better).
- Preparation in terms of coursework with passing grades in the following subject areas (the following are also subjects covered in the qualifying examinations):
  - Computer Architecture/Microprocessors
  - Operating Systems, Data Structures and Algorithms
  - Circuits (Analog Circuits and Systems, Digital Circuits, and VLSI Design)
  - EE-Systems (Signals and Systems, Digital Systems)
- Those found deficient in their preparation, but otherwise demonstrating good potential, may be admitted provisionally with required coursework to remove the deficiencies.
- GRE general test: typically, applicants admitted to the program have scores of: 700 or higher on Quantitative, 500 or higher on Verbal, and 3.5 or higher on Analytical
- TOEFL test for applicants whose native language is not English: typically, applicants admitted to the program have score of: (1) Paper based, 55/68 each on Listening, Reading and Structure/Writing, and 4.0/6.0 on TWE (Essay), (2) Computer based, 21/30 each on Listening, Reading and Structure/Writing, and 4.0/6.0 on TWE (Essay), or (3) Internet based, 21/30 each on Listening, Reading and Writing.
- Additionally, all applications for admission must also include the following:
  - Three letters of reference from people who can comment on the candidate's potential to succeed as a PhD student, and
  - The candidate's curriculum vitae, including a statement of objectives and interests.

Breadth & Depth Requirements

Three tracks of courses for the Computer Engineering program are defined and listed below. The breadth and depth requirements entail that three groups of classes be taken by a candidate:

- Group 1: 9 credit hours – All classes should be selected from a single track closest to the candidate's dissertation research area to be determined by the supervisory committee.
- Group 2: 9 credit hours – All classes should be selected from two of the tracks not selected for Group 1. At least 3 credit hours should be selected from each of the two tracks.
- Group 3: (MINOR) 6 credit hours - CS OR EE approved minor courses other than the courses listed in the three tracks.

Depth requirements are decided by student, research advisor, and the supervisory committee. A total of 90 credit hours are required of which 24 to 30 credit hours may be used for dissertation. No fewer than 45 credit hours must be completed at UNL. College of Engineering policies apply for transfer of credits.

- **TRACK 1: CIRCUITS AND CYBER-PHYSICAL INTERFACES**
  - CSCE 43X/83X. Cyber-Physical Systems and Interfaces *
  - CSCE 434/834. VLSI Design
  - CSCE 436/836. Embedded Systems
  - CSCE 496/896. Special Topics-VLSI Physical Design
  - CSCE 932. Fault-Tolerance: Testing/Testable Design
  - ELEC 416/816. Materials and Devices for Computer Memory, Logic, and Display
  - ELEC 417/817. Integrated Circuits
  - ELEC 469/869. Analog Integrated Circuits
  - ELEC 470/870. Digital and Analog VLSI Design
  - ELEC 9XX. Advanced Analog and Mixed Signal Circuits*
- **TRACK 2: SYSTEMS**
  - CSCE 430/830. Computer Architecture
  - CSCE 413/813. Data Base Systems
  - CSCE 425/825. Compiler Construction
  - CSCE 432/832. High Performance Processor Architectures
  - CSCE 437/837. File and Storage Systems
  - CSCE 455/855. Distributed Operating Systems
  - CSCE 456/856. Parallel Programming
  - CSCE 458/858 Real-Time Systems
  - CSCE 435/835. Cluster and Grid Computing
  - CSCE 496/896 Special Topics-Self-Managing Computer Systems
  - CSCE 933. Fault-Tolerance: System Design and Analysis
  - ELEC 451/851. Linear System Analysis and Design
  - ELEC 479/879. Digital Systems Organization and Design
  - ELEC 8XX. Discrete/Continuous System Modeling and Simulation*
  - ELEC 9XX. Advanced Digital Design*
- **TRACK 3: COMMUNICATIONS, NETWORKING, & SIGNAL PROCESSING**
  - CSCE 462/862. Communication Networks
  - CSCE 464/864. Internet Programming

- CSCE 496/896. Special Topics-Adv Internet Technologies
- CSCE 496/896. Special Topics-Data and Network Security
- CSCE 496/896. Special Topics-Sensor Networks
- CSCE 463/863. Introduction to Coding Theory
- CSCE 472/872. Digital Image Processing
- CSCE 473/873. Computer Vision
- CSCE 952. ADV Computer Network
- CSCE953. Optical Communication Networks
- CSCE 990. Seminar-Network Systems
- CSCE 990. Special Topics-Advanced Sensor Networks
- ELEC 408/808. Electromagnetic Fields and Waves
- ELEC 410/810. Multivariate Random Processes
- ELEC 462/862. Communication Systems
- ELEC 463/863. Digital Signal Processing
- ELEC 464/864. Digital Communication Systems
- ELEC 465/865. Data Compression
- ELEC 467/867. Electromagnetic Theory and Applications
- ELEC 498/898. Image and Video Processing
- ELEC 911. Communication Theory
- ELEC 912. Error Control Coding
- ELEC 915. Adaptive Signal Processing
- ELEC 996. Multi-camera Systems
- ELEC 996. Wireless Communications

*Final course numbers to be assigned for XX courses

Qualifying Examination:

- *Frequency*: Once per semester (Fall and Spring) with a schedule to synchronize with the qualifying examination for the PhD in Computer Science.
- *Structure*: The qualifying examination will be divided into four subject areas: (1) Computer Architecture/Microprocessors, (2) Operating Systems, Data Structures and Algorithms, (3) Circuits (Analog Circuits and Systems, Digital Circuits, and VLSI Design), and (4) EE-Systems (Signals and Systems, Digital Systems). It will comprise of four equally weighted problems from each of the four tracks, for a total of 16 problems.

- *Choice of Problems*: The candidate may choose to answer 8 of the 16 problems, with the following stipulations: (a) at least one problem must be chosen from each of the four subject areas and (b) At least three problems must be chosen from either subject areas (1) and (2) or subject areas (3) and (4).

Comprehensive Examination:

- The candidate's supervisory committee may choose from one of the following two formats.
    - Writing an in-depth dissertation proposal, including a comprehensive review of the literature describing the state-of-the-art related to the broader topic.
    - Preparing a research proposal similar in form and contents to an NSF-proposal.

Supervisory Committee:

- The supervisory committee must be formed after the candidate has passed the qualifying examination, according to the schedule stipulated by the Graduate Studies.
- The candidate's dissertation advisor serves as the chair of the supervisory committee. If the candidate has two dissertation advisors, both serve as co-chairs of the supervisory committee.

When the candidate's advisor(s) belong to just one department (CSE/EE), the supervisory committee must include at least one member from another department (EE/CSE), who also serves on the reading committee.

5. Facilities and Space Available to The Program

Laboratories to support all the instructional and research activities of the program are currently maintained in both CSE and EE departments in Avery Hall, Schorr Center and Scott Engineering Center. No additional physical space is needed for this program.

a. Equipment

A number of instructional and research laboratories are currently used to support the current PhD Program in Computer Engineering. CSE also offers an extensive heterogeneous network for use in research and graduate instruction. This network includes about 50 Sun Sparc and SGI workstations, 25 Sun Rays terminals, and more than 100 dual-boot high end PCs running Linux and Windows. Both research and instructional systems are supported by a wide range of software, a variety of printers, and several scanners. Computer support services are provided by two full-time system support managers and several student assistants.

Holland Computing Center: CSE also is home to the Holland Computing Center (HCC) with two primary locations interconnected by 1 Gbps, and soon to be 10 Gbps, fiber optic networking. The 1800 sq. ft. HCC machine room at the Peter Kiewit Institute (PKI) in Omaha can provide up to 500 kVA in UPS and genset protected power, and 160 ton cooling. Networking to Internet2 is in

place at 1 Gbps and will be upgraded to 10 Gbps this month. A 2200 sq. ft. second machine room in the Schorr Center at the University of Nebraska-Lincoln (UNL) can currently provide up to 60 ton cooling with up to 400 kVA of power, and is already connected at 10 Gbps to Internet2. HCC's resources at UNL have evolved to include three distinct offerings: PrairieFire, Red and Merritt.

PrairieFire, a linux cluster, is dedicated to general campus usage, with 400 compute cores interconnected by low-latency infiniband networking. The largest machine on the Lincoln campus is Red, with over 1000 cores interconnected by less expensive, but also higher-latency, gigabit Ethernet. More importantly, Red serves up over 200 TB of storage using HDFS (Hadoop Distributed File System), an open source version of the file system Google uses. Finally, Merritt, an Altix 3700 from SGI with 512 GB of shared memory (RAM), has proven valuable for certain memory intensive applications, even though its 64 cpu are considerably less than what is available from Red or PrairieFire.

In addition, a number of specialized research laboratories are also available.

Computer Networking Lab. This lab includes high-speed network equipment such as the Ciena Core Director CI optical switch, Netgear Gigabit Ethernet switch and multiple workstations. The lab is connected by high-speed network to the campus border edge router and from there to the optical fiber connecting UNL and the nearest regional provider (Great Plains Network in Kansas City).

ADSL Laboratory. The Abacus Distributed Storage Lab (ADSL) is equipped with the state-of-the-art computing platforms for storage and computer architecture research. In addition to a RAID testbed with an AMD Opteron Dual-Core 2.2GHz Processor, 2GB DDRAM, and 15 Western Digital WD1600AAJS-08PSA 160G SATA hard drives attached by a Marvell 88SX50XX SATA adapter, the lab has an 8-node cluster, with each node containing a quad-core Xeon CMP with hyperthreading capabilities and thus supporting 64 threads. The cluster's total DDR3 and HDD capacities are 28GB and 10TB respectively. It also has 1 HPC workstation, 4 Dell Optiplex GX series and 3 Dimension series PCs. All facilities are connected to a Gigabit switch to form a high-speed network.

Computer Architecture Laboratory. This Lab is still growing and currently has one server and a number of licensed software packages, including commercial benchmark suites such as "SPEC CPU 2000", "SPEC OMP 2001" and "SPEC CPU 2006".

Cyber Physical Networking (CPN) Laboratory. CPN Lab is spread around a 1, 300 square foot area with 43 connection slots attached to the ceiling, where an Ethernet and power supply infrastructure has been implemented above the ceiling. Each slot can be used to connect a sensor node or an actor node through Ethernet or USB connections. The inventory in the lab consists of over 200 sensor nodes including MicaZ, SunSPOT, TMoteSky/TelosB, IRIS, and Imote2 as well as NB100/NSLU2 and HP iPAQ hw6925 gateways; CMUCam3 CMOS cameras and Acroname Garcia Mobile Robots. Each slot of the Testbed infrastructure corresponds to a USB connection of a central server. The existing Ethernet infrastructure is enhanced through USB hubs that can be used for future expansion of the Testbed and also to support additional platforms not based on USB.

UNL Smart Space: Smart Space is an 800 square foot lab that is specially configured for work on wireless sensor networks and localization algorithms with an emphasis on applications to the health care and assistive technology. The focus of these applications is to improve the quality of life and reduce the burden of care associated with disabilities and aging. This space currently has a first generation Cricket wireless sensor network that is integrated with a state of the art environmental control system and an intelligent adaptive agent synthesizes information from a variety of sensors to make decisions and to engage the rooms occupant in dialogues related to the environment and health care. Unlike most other smart rooms, the UNL Smart Space also has the capability to address cognitive deficits, such as memory loss and dementia, associated with some disabilities and aging. If certain predefined circumstances, i.e. events such as an occupant's position, are detected, the control system then triggers predefined operations, i.e. actions, to interact with the environment such as turning on a nearby light. In order to provide a better user experience and to meet standards of care, the event-action operations have timing constraints, where an action must be completed within certain deadline from the time any event physically occurs. Accordingly, the Smart Space application provides natural evaluation scenarios for real-time communication with WSNs.

Robotics Lab. This lab focuses developing algorithms and hardware for hybrid robot and sensor network systems. The lab has the necessary expertise and equipment to develop novel platforms that enable cutting edge research in sensor networks and robotics.

NIMBUS Lab. Nebraska Intelligent MoBile Unmanned Systems Lab researches software and systems engineering, robotics, and sensor networks to develop more capable and dependable UAVs. The facilities in NIMBUS include numerous UAVs, sensors, control systems, and the facilities to support these cutting edge systems.

ANDES Lab. It is a collection of sixteen highly configurable PC computers and Sun Workstations. The PC systems are bootable under Windows XP, Solaris X86, Linux, or BSDI operating systems.

6. Budget

Projected expenses are listed in Table 1 on next page.

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Computer Engineering PhD Program

	(FY_2012_) Year 1		(FY_2013_) Year 2		(FY_2014_) Year 3		(FY_2015_) Year 4		(FY_2016_) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty											0	$0
Professional											0	$0
Graduate assistants [1]	9	$144,875	9	$144,875	9	$144,875	9	$144,875	9	$144,875	9	$724,375
Support staff											0	$0
Subtotal	9	$144,875	9	$144,875	9	$144,875	9	$144,875	9	$144,875	9	$724,375
Operating												
General Operating												$0
Equipment												$0
New or renovated space												$0
Library/Information Resources												$0
Other												$0
Subtotal		$0		$0		$0		$0		$0		$0
Total Expenses	9	$144,875	9	$144,875	9	$144,875	9	$144,875	9	$144,875	**9**	**$724,375**

[1] These expenses are not new expense but are reallocation of existing assistanships from the unified Engineering PhD program.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Computer Engineering PhD Program

	FY(_2012_) Year 1	FY(_2013_) Year 2	FY(_2014_) Year 3	FY(_2015_) Year 4	FY(_2016_) Year 5	**Total**
Reallocation of Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$163,800	$171,990	$180,590	$189,619	$199,100	$905,098
Other Funding						$0
1						$0
2						$0
3						$0
Total Revenue	$163,800	$171,990	$180,590	$189,619	$199,100	$905,098

[1] The tuition and fees do not represent new funding but are from tuition and fees normally received from the unified Engineering PhD program. The tuitions and fees are approximated based upon an assumed enrollment, number of credit hours generated per student per year and the revenue from each credit hour. For example, revenue for Year 1 is based upon the assumption that there will be 13 PhD students taking 18 credit hours per year at an average tuition and fees rate of $700 per credit hour resulting in a total revenue of $163,800. Revenue for Year 2 (and subsequent years) assumes a 5% combined yearly increase in student credit hour generation and average tuition and fees per credit hour resulting in a total revenue of $171,990.

Electrical Engineering Standalone Doctoral Program

Statement of Justification

There are an estimated 318,700 electrical engineering jobs in U.S. (as of 2009). The U.S. Bureau of Labor Statistics predicts that job growth in electrical engineering will be 2% over the decade of 2008-2018.

In 2007, 2,380 doctoral degrees were awarded by U.S. institutions. The number of doctoral degrees awarded has been increasing at an average rate of 14% since 2003. Of the 2,380 graduates, 645 or 27% were awarded to U.S. citizens/permanent residents, with the remaining 1,735 being awarded to foreign students, whose 5-year stay rate after obtaining their doctorates is 62%.

The National Science Board predicts that the science and engineering workforce will continue to grow but at a slowing rate as individuals reach traditional retirement age. Currently, 26% are older than 50, and 50% are older than 40. A much larger portion of doctorate holders are near retirement, with the greatest density in the 40-54 age range).

Unless large increases in degree production occur, the average age of workers with S&E degrees will rise; and barring large reductions in retirement rates, the total number of retirements among workers with scientific/engineering degrees will increase over the next 20 years.

As the University of Nebraska-Lincoln offers the only Ph.D. program in Electrical Engineering in the state of Nebraska, there will be no duplication of effort.

Faculty by Name and Area of Specialization

Electrical Engineering faculty and their areas of specialization are listed below. Their CVs are provided in Appendix A.

Name	Title	Area of Specialization
Alexander, Dennis R.	Kingery Engineering Professor	Ultrafast lasers and their applications, optical switches
Asgarpoor, Sohrab	Associate Professor, Associate Chair, and Undergraduate Advisor	Mathematical modeling, simulation, optimization, and advance computer applications in planning and operation of electric power systems including renewable energy sources (smart grid); impact of maintenance and equipment aging on system performance indicators such as availability, reliability, safety, and cost; risk assessment and vulnerability analysis of energy

Name	Title	Area of Specialization
		infrastructure
Bahar, Ezekiel	Professor	Electromagnetic theory, antennas and propagation, microwave engineering, remote sensing, optical polarimetry, chiral and negative refractive index materials
Balkir, Sina	Professor and Graduate Director	Very large scale integration systems, integrated circuits
Bauer, Mark	Senior Lecturer	Embedded system design and project management.
Boye, A. John	Professor	Control systems
Franke Schubert, Eva	Assistant Professor	Ion beam technology, thin film preparation and characterization, chiral hybrid materials, electronic materials, in situ process monitoring
Gursoy, Mustafa Cenk	Associate Professor	Wireless communications
Han, Ming	Assistant Professor	Fiber optic sensors
Hoffman, Michael W.	Professor and Undergraduate Advisor	Signal processing and adaptive systems
Hofmann, Tino	Research Assistant Professor	Ellipsometry
Hudgins, Jerry	Professor and Chairman, Director Center for Energy Sciences Research	Energy systems, wind energy, power electronics
Ianno, Natale J.	Blackman/Lederer Professor	Thin film deposition, nanoscale processing
Lu, Yongfeng	Lott Distinguished Professor	Nanoscale laser material processing and characterization
Patterson, Dean	Visiting Professor	High performance permanent magnet synchronous machines, including those with axial flux geometry
Pérez, Lance C.	Associate Professor, Associate Vice chancellor for Academic Affairs	Mobile communications and coding, sensor networks, and engineering education
Qiao, Wei	Assistant Professor	Renewable energy systems, smart grids, power electronics, electric machining and drives, and energy storage systems
Russell, David J.	Lecturer	Bioinformatics
Sayood, Khalid	Heins Professors	Data compression, joint source-channel coding, and various aspects of bioinformatics
Schubert, Mathias	Associate Professor	Optics and materials science
Snyder, Paul G.	Associate Professor	Ellipsometry
Vakilzadian, Hamid	Associate Professor	Modeling and simulation

Name	Title	Area of Specialization
Varner, Jerald L.	Associate Professor and Undergraduate Advisor	Digital signal processing
Velipasalar, Senem	Assistant Professor	Video/image processing, smart cameras
Woollam, John A.	George Holmes Distinguished Professor	Optical, electrical, and microstructural studies of solids, films, interfacial effects and environmental effects on materials; optical coatings, protective coatings, biomaterials and their interfaces
Zhou, Yunshen	Research Assistant Professor	Carbon nanomaterials and nanostructures

Students

Statistics for the past eight years are provided below; they are not available for 2001 and 2002.

	2003	2004	2005	2006	2007	2008	2009	2010
Applied	**23**	**28**	**16**		**41**	**37**	**77**	**64**
Admitted	?	3	7	13	16	8	15	15
Graduated	6	3	3	2	8	3	4	13

Description of the Curriculum

EE Graduate Committee

The Department of Electrical Engineering determines the membership in the EE Graduate Committee through a process outlined in the department bylaws. All members must be either Graduate Faculty Members or Fellows. One current graduate student in good standing is also asked to serve on the Graduate Committee.

The four faculty committee members, other than the Chair, will often be called upon to cast votes related to Graduate Committee issues. In the case of a tie, the Chair will cast the deciding vote. The student member serves in an advisory role and is not a voting member.

The EE Graduate Committee has several responsibilities related to the Ph.D. program. Generally, the Graduate Committee decides all issues and policies related to the graduate program in the EE Department. Outlined below are several of the specific duties:

- Review and decide admission/dismissal case for all EE graduate students.
- Through a formal application process, award teaching assistantships.

- Compile and administer Ph.D. Qualifying Examination.
- Administer the annual Graduate Research Paper Competition.
- Administer the Graduate Student Travel Grant awards.
- Recruit high-quality graduate students.

Program Requirements

The work required for the Ph.D. degree must be completed within eight consecutive years from the time of filing the student's program of studies. A minimum of 90 credit hours beyond the B.S. degree is required for the Ph.D. degree, with not fewer than 45 credit hours from UNL. The Office of Graduate Studies has established a residency requirement for the purpose of ensuring that the doctoral program should be reasonably compact, continuous, and coherent; and that a substantial portion be, in fact, done at and under close supervision by faculty at UNL. The Ph.D. residency requirement is normally satisfied by completing 27 credit hours of graduate work within a consecutive 18-month period. The EE Department waives the requirement for language and research tools.

Ph.D. Admission Status

To enter the Ph.D. program, students have two options to choose from:

1. A student can apply with an existing M.S. degree. In this case, the student must have completed the equivalent of the UNL M.S. degree in EE or a closely related field.
2. A student can also apply directly to the Ph.D. program with a B.S. degree without an existing M.S. degree. In this case, the student must have completed the equivalent of the UNL B.S. degree in EE or a closely related field.

All Ph.D. applicants must submit three letters of recommendation. All admitted Ph.D. students are considered provisional until after successful completion of the Ph.D. Qualifying Examination.

Ph.D. Qualifying Examination

The Electrical Engineering Ph.D. Qualifying Exam is offered only during the Fall and Spring semesters.

- For Ph.D. students with a prior M.S. degree: Only **two attempts to pass** the exam are allowed. These students **need to pass by the third semester** of their program, and the latest they can use their first attempt to pass is during the second semester of their program.

- For direct Ph.D. students with a B.S. degree: Only **two attempts to pass** the exam are allowed. These students **need to pass by the fifth semester** of their program, and the latest they can use their first attempt to pass is during the fourth semester of their program.

For both cases, the first semester of the program is defined as the semester in which an EE graduate course is taken as a Ph.D. student.

The examination consists of a Mathematics section with five questions and an EE section with a total of six questions in three areas selected by the student. Each section requires an overall grade of 70% to pass. The examination is closed book and closed notes. Nonprogrammable calculators will be supplied by the Department during the examination. All work must be shown to receive full credit. It is given in a single day, with a total of eight hours for both sections. After the overall grade has been compiled, the student may review the examination but is not allowed to keep the examination.

One mathematics question is provided from each area listed below. At the time of the examination, the student selects three of the five mathematics problems to work. An average score of 70% is required to pass.

Mathematics Areas
Probability and Random Processes
Differential Equations
Vector Calculus
Matrix Theory
Transform Techniques

Prior to the examination, the student selects three of the following electrical engineering areas. Two questions will be supplied from each area. The student must work four of the six questions, with at least one from each area. An overall score of 70% is required to pass. The courses listed by each area cover the material the student will be tested on.

Electrical Engineering Area	**Course Numbers**
Communication Systems	ELEC 462/464
Digital Signal Processing	ELEC 304/463
Control Theory	ELEC 444/451
Electronic Circuits	ELEC 316 (circuits)/361
Digital System Design	ELEC 370/476
Electromagnetics	ELEC 306/467
Materials and Devices	ELEC 316(materials)/421
Power Systems	ELEC 438/406
Optics	ELEC 480/486

Information concerning the course outlines and appropriate books can be obtained from individual professors who have recently taught the courses. Recent teaching assignments can be obtained from the EE graduate secretary or by checking the department web page, www.ee.unl.edu. A general description of the courses can also be obtained from the UNL Undergraduate Bulletin.

An announcement of the Ph.D. Qualifying Examination sign-up will be posted at the beginning of each semester. The student **must** register for the examination (209N Scott Engineering) on or before the posted deadline, specifying the three areas on which he/she wishes to be tested. The examination date will be set by the Graduate Committee Chair and will typically be on a Saturday two months after the beginning of classes each semester. Students are notified by mail whether or not they passed the exam.

Members of the Supervisory Committee

Before the student is within 45 hours of completion of his or her program, the Supervisory Committee should be constituted with a minimum of four Graduate Faculty Fellows using the UNL form *Appointment of Supervisory Committee for the Doctoral Degree*. The Supervisory Committee will typically be chaired by the student's advisor, who must be a Graduate Faculty Fellow in the Electrical Engineering field. In the case of co-advisors, at least one of the co-advisors must be a Graduate Faculty Fellow in the Electrical Engineering field. All members of the Supervisory Committee must be members of the Graduate Faculty. At least one Graduate Faculty Fellow, external to the EE Department, must be on the Supervisory Committee.

Program of Studies

Immediately following the formation of the Supervisory Committee, the Committee should meet and design the student's program of study, which is a list of the courses the Committee believes will complete the student's Ph.D. program. The student will normally provide an oral presentation of preliminary results from his/her research and a proposal for a dissertation topic. This will help the Committee to more efficiently design the program of study, which is reported on the UNL form, *Program of Studies for the Doctoral Degree*. Transfer credits are denoted on this form. Ninety (90) credit hours beyond the B.S. degree are needed for the Ph.D. program.

Although the final decision is made by the Supervisory Committee, a typical program of study will include a minimum of 30 credit hours of dissertation research (ELEC 999) and 60 credit hours of formal course work. Not less than 50% of the course work (excluding dissertation hours) must be completed at UNL. Transfer credits can be from another institution or from an M.S. degree obtained from UNL. However, the EE Department does not allow the use of thesis research as transfer credit. Under no circumstances can transfer hours be taken from another Ph.D. degree.

Scholastic Grade Requirements

The EE Department has the following minimum requirements for students in the Ph.D. program. Violation of any of these requirements can result in academic probation or dismissal from the graduate program.

- A minimum grade of B must be obtained in each 800-level course with a 400-level counterpart.
- With the exception of thesis/dissertation hours, classes taken as pass/no-pass (P/NP) cannot be used for graduate credit in the Ph.D. degree program within the EE Department.
- A minimum grade of C must be obtained for graduate-only courses (900-level or 800-level with no 400 counterpart.
- It may be necessary at times for a student to withdraw from a course or courses. However, if the Graduate Committee perceives a pattern of abuse of the withdrawal system, the student will be placed on probation for the following semester. Withdrawal from a course during the probationary period will be considered unsatisfactory.
- All Ph.D. students in the EE Department are required to maintain an overall graduate GPA of 3.0.

Probation and Termination

The UNL Graduate Studies Bulletin states that no student on probation may receive a graduate degree. For all graduate students at UNL, probation or termination recommendations may be made under any of the following conditions:

- Violations of the Student Code of Conduct.
- Failure to satisfy scholastic grade requirements.
- Failure in provisional/comprehensive/qualifying examinations.
- Failure to master the methodology and content of ones field in a manner that is sufficient to complete a successful thesis or dissertation.
- Ethical misconduct or lack of professional promise in a professional field.

During the Ph.D. program, the Supervisory Committee plays an important role in the student's education. Therefore, the general procedure leading to possible termination of Ph.D. students includes the Supervisory Committee in the decision making process. After each occurrence of unsatisfactory academic performance, the Graduate Committee sends a letter to the academic advisor, who is asked to reach a consensus among the members of the Supervisory Committee as to a proper course of action. Within approximately two weeks, the advisor must reply to the Graduate Committee with a recommendation from the Supervisory Committee. The three options are a warning, academic probation, or termination from the Ph.D. program. Using this recommendation, the Graduate Committee sends a letter to the student, with copies to each member of the Supervisory Committee, explaining the action to be taken. When the Supervisory Committee has yet to be formed, the Graduate Committee consults solely with the advisor. However, the final decision is made by the Graduate Committee.

A student placed on probation for scholastic reasons must achieve satisfactory performance in all future semesters or Summer sessions until the probationary status is lifted. Satisfactory performance will be evaluated on courses appropriate to be used for the EE graduate degree, as determined by the Graduate Committee. Performance in courses unrelated to the EE graduate degree will not be considered. The probation status will remain in effect until the overall graduate GPA is raised to at least 3.0.

Admission to Candidacy (Ph.D. Comprehensive Examination)

The Ph.D. Comprehensive Examination shall be conducted by the Ph.D. Supervisory Committee of the individual student. The Comprehensive Examination will be given only after the student has substantially completed his/her course work outlined in the student's program. Normally, the Comprehensive Examination is given in the semester following the completion of all formal course work. The comprehensive examination will be a written examination and will be designed to test the student's **breadth** of knowledge and will not be simply a repetition of course work. The Supervisory Committee may require an oral defense of the Comprehensive Examination. If the student fails the Comprehensive Examination, the Supervisory Committee may decide to give the student a second chance or to recommend, to the Office of Graduate Studies, his/her admission to candidacy for the Ph.D. degree using the UNL form, *Application for Admission to Candidacy for the Doctoral Degree*. The examination results should be reported to the Office of Graduate Studies at least seven months before the final oral examination.

Application for Degree

The UNL form, *Application for Degree,* must be filed at the beginning of the semester or Summer session in which graduation is planned. A nonrefundable application fee is also required at the time of submission.

Preliminary Copies of Dissertation

All Ph.D. students must complete a dissertation under the supervision of a fellow of the Graduate Faculty. It is expected that the dissertation research will make an original and significant contribution to the field and is of a quality that could be published in a refereed journal. The student is required to write the dissertation in a standard style (see the *Guidebook for Preparing Your Thesis or Dissertation* available from the Office of Graduate Studies).

Following a thorough review by the advisor, copies of the dissertation are given to the members of the Reading Committee (two members of the Supervisory Committee, excluding the chair). The student must give the Reading Committee at least two weeks for review. Upon approval of the Reading Committee, a copy of the completed *Application for Final Oral Examination* and a copy of the dissertation are submitted to the Office of Graduate Studies, at least three weeks prior to the final oral examination.

Final Oral Examination

The final oral examination is required of all Ph.D. students. The oral examination should be scheduled for two hours and consist of the presentation and defense of the research. The presentation is open to the public, and all EE faculty and graduate students are strongly encouraged to attend. It is the student's responsibility to properly announce the defense date, time, and location one week in advance of the examination. After the public presentation, and a question-and-answer period, the remainder of the examination is conducted privately by the Supervisory Committee.

The Supervisory Committee may require the student to make changes to the dissertation and/or conduct additional research. The advisor is generally responsible for making sure that the work is completed.

Final Examination Report

After appropriate changes have been made to the dissertation based on the comments of the Committee and the Supervisory Committee has approved the dissertation, the student must make several copies of the dissertation. The student is required to give a hard-bound copy to the advisor as well as to the departmental office. It is also customary to offer each member of the Supervisory Committee a copy of the final dissertation. The student should also submit official copies through the Office of Graduate Studies and the UNL Library. A complete description of the final copy requirements can be found in the *Guidebook for Preparing Your Thesis or Dissertation* available from the Office of Graduate Studies.

For tracking purposes, the student is required to complete an *EE Department Exit Survey* which is found on the department web page.

Summary of Procedures for Ph.D. Degree

A summary of the procedures described above follows. Students are responsible for following procedures, and seeing that all forms are filed by the appropriate deadlines. A Ph.D. Checklist is provided with major milestones in the Ph.D. program. The student should use this checklist to track his/her progress.

- Beginning of Program: Registration by consultation with Graduate Committee Chair and the major advisor and with the approval of the Dean of Graduate Studies.

- By End of Third Semester in Program: Pass Ph.D. Qualifying Examination.

- Before 45 Credit Hours Remain in Program: Appoint Supervisory Committee.

- Immediately After Appointment of Supervisory Committee: Devise and submit program of studies.

- After Completing Formal Course Work: Pass Ph.D. Comprehensive Examination at least seven months before Final Oral Examination.

- Beginning of Graduation Semester: File the *Application for Degree* at the Office of Registration and Records.

- Two Weeks Before Submitting Application or Final Oral Examination: After thorough review by the advisor, present preliminary copy of dissertation to Reading Committee.

- Three Weeks Before Final Oral Examination: Submit the form *Application for Final Oral Examination* with Reading Committee approval. Also submit a copy of the dissertation and abstract for preliminary review.

- Two Weeks (one week in Summer) Before Final Oral Examination: Present a preliminary copy of the dissertation to all members of the Supervisory Committee.

- One Week Before Final Oral Examination: Produce announcement for the dissertation defense and distribute to all EE faculty and graduate students.

- Day of Final Oral Examination: Present required oral defense of dissertation research.

- After Passing Final Oral Examination: Deposit final copies of the dissertation in proper form along with a signed agreement for microfilming the dissertation and publication of the abstract, with the Dean of University Libraries, after final approval from the doctoral specialist in graduate studies. Deliver the certificate of deposit, signed by members of the Supervisory Committee, the Dean of University Libraries, and the Comptroller, to the Office of Graduate Studies.

- After Passing Final Oral Examination: One hard-bound copy of the dissertation should be deposited with the EE graduate secretary. The student is required to complete the *EE Department Exit Survey*.

Facilities and Space Available to the Program

The department has extensive research facilities for all areas including state of the art computing facilities, integrated circuits and systems research facilities, communications and signal-processing laboratories, applied electromagnetics research, solid state laboratories, nanostructures research, electro-optics research and energy systems laboratories.

In addition to computing facilities individually operated by each research group, the department administers a network of high-end UNIX workstations and PCs, upgraded regularly, and used for classroom instruction as well as the individual needs of students.

For integrated circuits and systems research, a network of workstations is maintained with VLSI CAD software that includes Mentor Graphics, Hspice, Xilinx placement and routing tools, and Tanner. VLSI test facilities include data acquisition and RF and mixed-signal test and measurement instruments for integrated circuit characterization.

Communications and signal-processing laboratories are maintained for data compression, error control coding, array signal processing, mobile communications, bioinformatics, and biomedical signal processing research activities.

Applied electromagnetics research facilities include an optical polarimetric scatterometer, an atomic force/scanning tunneling microscope, and an anechoic chamber facility.
The **solid state laboratories** have a full array of material processing and device fabrication facilities along with specialized equipment for measurement, allowing research on thin-film deposition and characterization, photolithography systems, ellipsometry for in-situ monitoring of growth processes, plasma etching and the study of breakdown phenomena, and diamond film growth at low temperatures.

Nanostructures research includes facilities for the study of self-assembly of quantum dots and wires, their properties in cryogenic, noise-isolated environments, and the creation of nanostructures as well as hard materials coatings.

Other **electro-optics research** focuses on femto- and atto-second laser techniques and sensor development using a high-powered ultra-short pulse laser, and optical diagnostics and spectroscopy equipment.

The **energy systems laboratories** include test and measurement equipment for high temperature and cryogenic environments for power electronics converters and semiconductor devices, as well as a test bed for advanced electric machine prototypes.

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Electrical Engineering PhD Program

	(FY_2012_) Year 1		(FY_2013_) Year 2		(FY_2014_) Year 3		(FY_2015_) Year 4		(FY_2016_) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty											0	$0
Professional											0	$0
Graduate assistants [1]	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$1,350,315
Support staff											0	$0
Subtotal	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$1,350,315
Operating												
General Operating												$0
Equipment												$0
New or renovated space												$0
Library/Information Resources												$0
Other												$0
Subtotal		$0		$0		$0		$0		$0		$0
Total Expenses	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$270,063	9.5	$270,063	**9.5**	**$1,350,315**

[1] These expenses are not new expense but are reallocation of existing assistanships from the unified Engineering PhD program.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Electrical Engineering PhD Program

	FY(_2012_) Year 1	FY(_2013_) Year 2	FY(_2014_) Year 3	FY(_2015_) Year 4	FY(_2016_) Year 5	**Total**
Reallocation of Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$252,000	$264,600	$277,830	$291,722	$306,308	$1,392,459
Other Funding						$0
1						$0
2						$0
3						$0
Total Revenue	$252,000	$264,600	$277,830	$291,722	$306,308	$1,392,459

[1] The tuition and fees do not represent new funding but are from tuition and fees normally received from the unified Engineering PhD program. The tuitions and fees are approximated based upon an assumed enrollment, number of credit hours generated per student per year and the revenue from each credit hour. For example, revenue for Year 1 is based upon the assumption that there will be 20 PhD students taking 18 credit hours per year at an average tuition and fees rate of $700 per credit hour resulting in a total revenue of $252,000 Revenue for Year 2 (and subsequent years) assumes a 5% combined yearly increase in student credit hour generation and average tuition and fees per credit hour resulting in a total revenue of $264,600.

Proposal to develop a Stand-Alone Ph.D. Program

in

Mechanical Engineering and Applied Mechanics (ME&AM)

The Engineering Ph.D. fields of Engineering Mechanics and of Mechanical Engineering propose the separation from the joint Engineering Ph.D. program into a single stand-alone Ph.D. program in Mechanical Engineering and Applied Mechanics (**ME&AM**). The two programs are sister fields and in most universities are joined into a single degree program. The ME&AM Ph.D. will include the following specialties:

1. Thermal Sciences
2. Fluid Mechanics
3. Solid Mechanics
4. Systems, Design and Controls
5. Dynamics and Vibrations
6. Computational Methods

Evidence of Need and Demand

Program Justification: These six areas comprise one cornerstone of all engineering programs. The merger of the two Ph.D. fields of Engineering Mechanics and Mechanical Engineering will:

1. Brings together two complementary faculties to construct a coherent program that is more in line with the current national trends.
2. Combines the administrative components of the two fields to more efficiently manage and advertise the Ph.D. program.
3. Constructs a combined Graduate Faculty in a Ph.D. program that will become more recognized and will be more competitive nationally and internationally.
4. Create a unit that will produce doctoral degrees, journal publication, and faculty and program funding at a level that should move up the new stand-along program's ranking in national surveys.
5. Produce a degree that is more in line with our Big 10 partners, and may provide more opportunities to collaborate in programmatic areas.

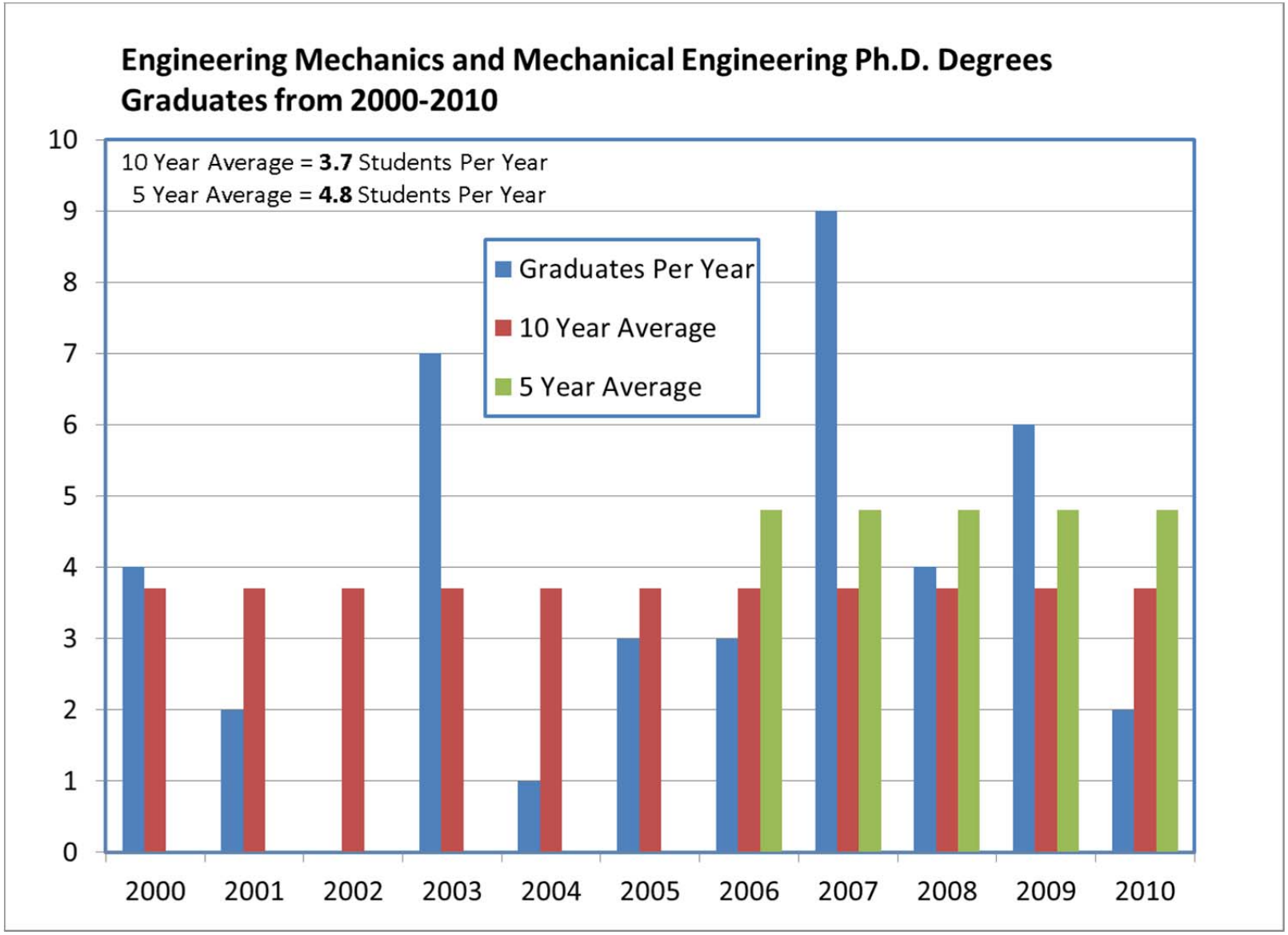
The sustained student body and degree production in the two fields of Engineering Mechanics and Mechanical Engineering over the past ten years is evidence of both sustained student interest in the degrees, and is also an indication of sustained research funding for the resulting group. The attached figure shows that in the last ten years the two programs have graduated on average 3.8 Ph.D. each year, and **in the last five years have averaged 4.8 Ph.D. degrees per year**. The attached table provides the details of the degrees granted. The graduates of the program are sought by others to the extent that we have had three graduates placed in faculty positions.

The separation from the Unified Ph.D. Program in the College of Engineering can provide the new ME&AM program with the opportunity to coordinate our current assets, better advertise the degree, improve current rankings, attract more funding, help us compete with other programs, and provide opportunities to collaborate with our Big 10 partners.

Structure of the program: The new stand-alone program in ME&AM will bring together the faculty associated with the Engineering Mechanics and of Mechanical Engineering Ph.D. fields. The following is a listing of the current faculty:

- Mechanical Engineering Field:
    - John P. Barton, Professor
    - Kevin D. Cole, Associate Professor
    - Shane M. Farritor, Robert W. Brightfelt Professor of Mechanical Engineering
    - George Gogos, Professor
    - Linxia Gu, Assistant Professor
    - Jinsong Huang, Assistant Professor
    - David Y.S. Lou, Ludwickson Professor of Mechanical Engineering
    - Carl A. Nelson, Associate Professor
    - John D. Reid, Professor
    - Brian W. Robertson, Professor
    - Jeffrey Shield, Professor
    - Wieslaw M. Szydlowski, Associate Professor
    - Cho Wing S. To, Professor
    - Zhaoyang Zhang, Associate Professor
- Engineering Mechanics Field:
    - Eveline Baesu, Associate Professor
    - Florin Bobaru, Associate Professor
    - Namas Chandra, Elmer E. Koch Professor of Engineering Mechanics and Associate Dean for Research
    - Yuris A. Dzenis, R. Vernon McBroom Professor
    - Ruqiang Feng, Professor
    - Jung Yul Lim, Assistant Professor
    - Mehrdad Negahban, Professor
    - Shadi Othman, Assistant Professor
    - Li Tan, Harold and Esther Edgerton Associate Professor
    - Joseph A. Turner, Professor
    - Jiashi Yang, Associate Professor

Facilities and Equipment: The PhD degree will be using the existing equipment and facilities currently being used for the PhD fields of Engineering Mechanics and Mechanical Engineering in the Engineering PhD. No new equipment or facilities are anticipated as a result of this construction of PhD programs and the construction of the new PhD in Mechanical Engineering and Applied Mechanics.



PhD Production: The following graph provides the number and average number of PhD degrees granted in the two PhD fields of Engineering Mechanics and Mechanical Engineering.

Ph.D. in Mechanical Engineering and Applied Mechanics

(Program Requirements for the Degree)

Vision: To provide a nationally and internationally recognized program and degree in the area of Mechanical Engineering and Applied Mechanics.

Specialty Areas: There are five areas of specialty in the program that include

1. Thermal Sciences
2. Fluid Mechanics
3. Solid Mechanics
4. Systems, Design and Controls
5. Dynamics and Vibrations
6. Computational Methods

Policy for Doctor of Philosophy in Mechanical Engineering and Applied Mechanics (ME&AM): A student interested in obtaining a Ph.D. in ME&AM needs to complete the following requirements in addition to those required by the Graduate School.

1. **Qualifying exams**: A student is expected to successfully complete the written qualifying exams **within 18 months of entering the Ph.D. program**. All students will need to complete a qualifying exam in
    a. Engineering Analysis

    And, at least two exams from the following subject areas:

    b. Heat transfer and thermodynamics
    c. Fluid mechanics
    d. Solid mechanics
    e. Systems, design, and controls,
    f. Dynamics and vibration
    g. Computational methods
    h. Materials

    The subject matter of the qualifying exams is selected by the faculty in the specific area and is to be at the upper undergraduate and beginning graduate levels.

    In the event that a student does not pass a written qualifying exam, either the Graduate Committee or the student may request an oral examination on the subject. An examining committee of no less than three faculty of the program will sit on an oral examination.

2. **Special course requirements:** All doctoral students will complete **at least three graduate courses in the area of designated specialization** and **at least one graduate course from each of**

four other areas that may be selected from the following list of categories (excluding area of specialization):

a. Engineering analysis (Math 821 will not count)
b. Heat transfer and thermodynamics
c. Fluid mechanics
d. Solid mechanics
e. Systems, design, and controls
f. Dynamics and vibrations
g. Computational methods
h. Experiments and instrumentation
i. Materials

These courses may include courses that are transferred into the program from the master or other degree.

All students will register each semester for ME&AM seminar course. Students may request a waiver of this rule for a given semester.

3. **Dissertation:** The student's dissertation should show technical mastery of their area of specialization and must advance or modify former knowledge in this area.
4. **Final oral defense:** An oral defense of the dissertation will be given by the Supervisory Committee after the candidate's studies have been completed and the dissertation has been given preliminary acceptance by the designated readers. The final oral exam **will be open to the public** and **announced to the faculty and students and posted publically at least one week in advance of the defense**.

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Mechanical Engineering and Applied Mechanical PhD Program

	(FY_2012_) Year 1		(FY_2013_) Year 2		(FY_2014_) Year 3		(FY_2015_) Year 4		(FY_2016_) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty											0	$0
Professional											0	$0
Graduate assistants [1]	15	$283,462	15	$283,462	15	$283,462	15	$283,462	15	$283,462	15	$1,417,310
Support staff											0	$0
Subtotal	15	$283,462	15	$283,462	15	$283,462	15	$283,462	15	$283,462	15	$1,417,310
Operating												
General Operating												$0
Equipment												$0
New or renovated space												$0
Library/Information Resources												$0
Other												$0
Subtotal		$0		$0		$0		$0		$0		$0
Total Expenses	15	$283,462	15	$283,462	15	$283,462	15	$283,462	15	$283,462	**15**	**$1,417,310**

[1] These expenses are not new expense but are reallocation of existing assistanships from the unified Engineering PhD program.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

Mechanical Engineering and Applied Mechanical PhD Program

	FY(_2012_) Year 1	FY(_2013_) Year 2	FY(_2014_) Year 3	FY(_2015_) Year 4	FY(_2016_) Year 5	**Total**
Reallocation of Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$252,000	$264,600	$277,830	$291,722	$306,308	$1,392,459
Other Funding						$0
1						$0
2						$0
3						$0
Total Revenue	$252,000	$264,600	$277,830	$291,722	$306,308	$1,392,459

[1] The tuition and fees do not represent new funding but are from tuition and fees normally received from the unified Engineering PhD program. The tuitions and fees are approximated based upon an assumed enrollment, number of credit hours generated per student per year and the revenue from each credit hour. For example, revenue for Year 1 is based upon the assumption that there will be 20 PhD students taking 18 credit hours per year at an average tuition and fees rate of $700 per credit hour resulting in a total revenue of $252,000. Revenue for Year 2 (and subsequent years) assumes a 5% combined yearly increase in student credit hour generation and average tuition and fees per credit hour resulting in a total revenue of $264,600.

TO:	The Board of Regents	Addendum VIII-A-2
	Academic Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Establishment of a Master of Science in Emergency Preparedness under the sponsorship of the University of Nebraska Medical Center, College of Public Health	
RECOMMENDED ACTION:	Approval is requested to establish a Master of Science in Emergency Preparedness under the sponsorship of the University of Nebraska Medical Center	
PREVIOUS ACTION:	April 29, 2011 – The Board approved a professional certificate in Emergency Preparedness May 19, 2001 – The Board approved the Master of Public Health degree	
EXPLANATION:	The College of Public Health proposes the Master of Science in Emergency Preparedness for public health and other health professionals. The dual track, graduate degree addresses an unmet need and will offer professional training specific to students' health fields, thereby, enhancing their skills in serving the needs of the state's population. The Federal Department of Homeland Security's core focus areas (Prevent, Protect, Respond and Recover) have been adopted as the structural and conceptual foundation for the program. The proposal has been endorsed by the UNMC Graduate Council, the NU Council of Academic Officers, and the NU Executive Graduate Council.	
PROJECT COST:	$83,206 first year ($511,802 over five years)	
SOURCE OF FUNDS:	Tuition and reallocation of existing College of Public Health resources	
SPONSORS:	David A. Crouse, Interim Dean for Graduate Studies Interim Vice Chancellor for Academic Affairs Harold Maurer, Chancellor University of Nebraska Medical Center	
RECOMMENDED:	Linda R. Pratt Executive Vice President and Provost Dean of the Graduate College	
DATE:	March 19, 2012	

Master of Science in Emergency Preparedness

Submitted by

The Department of Epidemiology

In collaboration with The Center for Biopreparedness, Biosecurity and Emerging Infectious Diseases

College of Public Health

University of Nebraska Medical Center

984320 Nebraska Medical Center

Omaha, NE 68198-4320

Phone: (402) 552-2529

Fax: (402) 552-2769

Descriptive Information

Sponsoring Department: Epidemiology

Date of Submission: May 27, 2011

Recommended Program Start Date: Fall 2012

Degree Title: Master of Science in Emergency Preparedness

Other programs offered in this field by this institution: Graduate Certificate in Emergency Preparedness

Description Of The Program

Executive Summary

The Center for Biopreparedness, Biosecurity and Emerging Infectious Diseases (hereafter referred to as the CBBEID) is located in the College of Public Health at the University of Nebraska Medical Center. An operational sub-component, the Preparedness Education Program, has been operational since 2002 through the Nebraska Department of Health and Human Services contract. Its mission is to enhance preparedness skills and knowledge in the areas of medical preparedness, first responder preparedness, public health preparedness, and business/industry preparedness through affordable, needs-based training; customized organizational assistance; and comprehensive resources. In 2002, in response to Federal and State initiatives to establish and improve the public health system's response to biological events, Nebraska Health and Human Services commissioned the state's two medical schools - Creighton University Medical Center and University of Nebraska Medical Center - to join forces to develop the Preparedness Education Program which is under the direction of the Infectious Disease Departments at both medical centers and a multi-agency consortium and now a major operational component of the Center for Biopreparedness, Biosecurity and Emerging Infectious Diseases.

The creation of an academic program in preparedness will complement the new and expanding College of Public Health. Eight years of experience in the design and development of adult learner oriented curriculum and an extensive collection of educational material through the Preparedness Education Program, contributes to the design, development and delivery of academic courses in the proposed Masters degree in the College of Public Health. As a regional leader in the field of Preparedness, the CBBEID has embarked on a variety of research projects, which will support a specialized niche for graduate students seeking academic mentors for further research.

An academic-based, graduate program in Emergency Preparedness in the department of Epidemiology, College of Public Health is proposed to be launched in the fall of 2012.

The Federal Department of Homeland Security's (DHS) core focus areas have been adopted as the structural and conceptual basis for all course development and are as follows: Prevent, Protect, Respond and Recover. This curriculum is unique nationally and will serve students well.

The key preparedness content material is structured and will be delivered through four core courses based on the above essential core areas. All four core courses for the proposed Masters of Science in Emergency Preparedness have been approved by the College of Public Health and UNMC's Graduate Council.

Organization Summary

The audiences for the emergency preparedness material have traditionally been health care professionals, public health and first responders, but as preparedness needs change and the disaster scenarios we face change, our programs and other offerings have also evolved to meet emerging needs. Participation has also increased because of the excellent quality of CBBEID programs.

Currently the training programs are delivered to a broad base of professionals involved in preparedness activities at all levels of their organizations and their communities. This diverse mix of professionals will continue to grow as the CBBEID expands its program offerings into the business/industry and educational sectors. The CBBEID offers continuing education credits for most programs, thus providing an added value to the busy professionals served. Partners include federal agencies and organizations such as CDC (Centers for Disease Control and Prevention) and USAMRIID (U.S. Army Medical Research Institute of Infectious Diseases) as well as Nebraska's Department of Health and Human Services.

The CBBEID also participated in The Association of Schools of Public Health (ASPH) project entitled: *Public Health Preparedness and Response Core Competency Development Project* and as such, will contribute its expertise and knowledge of federal requirements for emergency preparedness, to the Masters program

Centrality to Role and Mission

The UNMC Mission is to improve the health of Nebraska through premier educational programs, innovative research, the highest quality patient care and outreach to underserved populations. This new program will contribute to all elements of the mission and offers the academic framework for students and professionals to acquire knowledge and skills applicable to Emergency Preparedness.

Rationale for a New Degree Program

There has been a dramatic increase of interest in, and expenditures on, emergency preparedness. The lack of trained emergency personnel is itself an emergency according to "Trust in America's Health", the December 2010 Robert Wood Johnson

report. At the national level, there are currently only 12 graduate programs in Public Health Emergency Preparedness. Professionals already in the field have learned through experience and are known to be actively interested in new educational opportunities at the continuing education level. They can appreciate the intricacies of the field and the increasing frequency of opportunities that an advanced education will offer. Media coverage of both man-made (terrorism) and natural disasters has made the response community more visible to the general population and provides justification for more highly trained and educated personnel.

Program Of Study

The Masters program is an academic graduate program in Emergency Preparedness requiring 36 credit hours to complete. Students must choose to complete either a practice or academic track for this program. The program is based on the Public Health Preparedness and Response Core Competency Model as outlined by the Centers for Disease Control and Prevention (CDC) requested task force led by the Association for Schools of Public Health (ASPH). The content applies to the broader field of Emergency Preparedness.

The Competencies that will be taught in this Masters program are as follows:

1. Model Leadership
1.1 Solve problems under emergency conditions.
1.2 Manage behaviors associated with emotional responses in self and others.
1.3 Facilitate collaboration with internal and external emergency response partners.
1.4 Maintain situational awareness.
1.5 Demonstrate respect for all persons and cultures.
1.6 Act within the scope of one's legal authority.

2. Communicate and Manage Information
2.1 Manage information related to an emergency.
2.2 Use principles of crisis and risk communication.
2.3 Report information potentially relevant to the identification and control of an emergency through the chain of command.
2.4 Collect data according to protocol.
2.5 Manage the recording and/or transcription of data according to protocol.

3. Plan for and Improve Practice
3.1 Contribute expertise to a community hazard vulnerability analysis (HVA).
3.2 Contribute expertise to the development of emergency plans.
3.3 Participate in improving the organization’s capacities (including, but not limited to programs, plans, policies, laws, and workforce training).
3.4 Refer matters outside of one's scope of legal authority through the chain of command.

4. Protect Worker Health and Safety
4.1 Maintain personal/family emergency preparedness plans.
4.2 Employ protective behaviors according to changing conditions, personal limitations, and threats.
4.3 Report unresolved threats to physical and mental health through the chain of command.

The key preparedness content material is structured and delivered through four core courses based on the above essential core areas, and have been approved at both the College of Public Health and UNMC Graduate Council levels. These courses will be supplemented by 4-6 other College of Public Health courses, 2 elective courses (for the practice track only) and a Master's thesis requirement.

The four core course outlines are as follows:

HPRO 810: Emergency Preparedness: PREVENT

- Module 1: Introduction
- Module 2: History of Federal Disaster Policy
- Module 3: The National Response Framework
- Module 4: Incident Command System
- Module 5: Federal Disaster Response Agencies
- Module 6: Disaster Response Volunteer Agencies
- Module 7: Disaster Response Laboratory Response
- Module 8: Information Gathering – Fusion Centers
- Module 9: Strategic National Stockpile Program and other Stockpiling Systems
- Module 10: Federal Disaster Response Initiatives and Grants
- Module 11: Disaster Risk Assessment
- Module 12: Disaster Planning – Gathering and Engaging Stakeholders
- Module 13: Disaster Planning – Writing the Plan
- Module 14: Exercise Design – Background and Principles
- Module 15: Exercise Design – Design Steps, Implementation and Evaluation

EPI 811: Emergency Preparedness: PROTECT

- Module 1: Introduction
- Module 2: Critical Infrastructure Protection
- Module 3: Critical Infrastructure Protection
- Module 4: Food Safety
- Module 5: Agricultural Safety and Defense
- Module 6: Personal/Household Preparedness
- Module 7: Emerging Infectious Diseases
- Module 8: Emerging Infectious Diseases
- Module 9: Infection Prevention and Control
- Module 10: Infection Prevention and Control
- Module 11: Isolation and Quarantine
- Module 12: Isolation and Quarantine
- Module 13: Surveillance

Module 14: Surveillance
Module 15: Detection

HPRO 812: Emergency Preparedness: RESPOND

Module 1: Introduction
Module 2: On-site Incident Management
Module 3: Responder Safety and Health
Module 4: Animal Disease Emergency Support
Module 5: Environmental Health: (Part I) Mass Sheltering
Module 6: Environmental Health (Part II) The Sphere Project
Module 7: Weapons of Mass Destruction: Biological Agents
Module 8: Weapons of Mass Destruction: Chemical Agents
Module 9: Weapons of Mass Destruction: Radiation Events
Module 10: Weapons of Mass Destruction: Explosive Events
Module 11: Citizen Evacuation and Shelter-in-Place
Module 12: Search and Rescue
Module 13: Public Information and Warning: Risk Communications
Module 14: Mass Casualty Triage/ Pre-Hospital Treatment
Module 15: Medical Surge

HPRO 813: Emergency Preparedness: RESPOND & RECOVER

Module 1: Introduction
Module 2: Medical Surge
Module 3: Mass Immunization/Dispensing – Part I
Module 4: Mass Immunization/Dispensing – Part II
Module 5: Mass Fatalities Management
Module 6: Mass Fatalities Management
Module 7: Disaster Behavioral Health
Module 8: Children in Disasters
Module 9: Special/Vulnerable Populations
Module 10: Business and Industry Continuity of Operations
Module 11: Recovery – Part I
Module 12: Recovery – Part II
Module 13: Long Term Recovery
Module 14: Ethics in Disasters
Module 15: Current Research in Disaster Preparedness

Description of Courses and Degree Requirements

The proposed M.S. program will use existing graduate courses offered through the following units in the NU system:

- Department of Epidemiology in the College of Public Health
- Departments within the College of Public Health
- University of Nebraska at Omaha

The Proposed M.S. program will be offered as two separate and optional tracks as follows. Students must choose only one track:

1. A practice based track
2. An academic based track

Practice Track: Total Credits required - 36 credit hours

1. Required Courses (24 credit hours):
   HPRO 810: Emergency Preparedness: Prevent
   EPI 811: Emergency Preparedness: Protect
   HPRO 812: Emergency Preparedness: Respond
   HPRO 813: Emergency Preparedness: Respond and Recover
   HPRO 830: Foundations of Public Health
   EPI 820: Epidemiology: Theory and Application
   EPI 825: Infectious Disease Epidemiology
   CRCJ 8800: Terrorism (or equivalent) – University of Nebraska at Omaha
2. Two (2) electives as approved by the student's advisory committee (6 credit hours)
3. Master's Thesis (6credit hours)

Academic Track: Total Credits required - 36 credit hours

1. Required Courses (30 credit hours):
   HPRO 810: Emergency Preparedness: Prevent
   EPI 811: Emergency Preparedness: Protect
   HPRO 812: Emergency Preparedness: Respond
   HPRO 813: Emergency Preparedness: Respond and Recover
   HPRO 830: Foundations of Public Health
   EPI 820: Epidemiology: Theory and Application
   EPI 825: Infectious Disease Epidemiology
   BIOS 806: Biostatistics I
   HPRO 805: Applied Research in Public Health
   CRCJ 8800: Terrorism (or equivalent) – University of Nebraska at Omaha

2. Master's Thesis (6 credit hours): The thesis proposal must be approved by the student's Advisory Committee. The thesis work should reveal a capacity to carry on independent study or research and should demonstrate the student's ability to use the techniques employed in the field of investigation. The thesis must conform to the style accepted at UNMC. Examples may be viewed at the McGoogan Library of Medicine.

   The thesis must be presented in final form to the student's Advisory Committee at least two weeks before the date for the candidate's final oral examination (defense of thesis). A candidate shall not be eligible for the defense until the thesis is completed and approved by the thesis supervisor.

When the thesis defense has been completed successfully, one copy of the thesis must be supplied to the major department and two copies must be deposited in the McGoogan Library of Medicine. To meet requirements for completion of the degree in a given semester, the approved thesis and evidence of the successful defense must be in the Graduate Studies Office one week before the end of the semester.

Graduate Committee: The program has a Graduate Committee of three or more members formally appointed by the Dean for Graduate Studies but selected or elected by the program Graduate Faculty. Each new graduate student will be assigned an advisor. The Graduate Committee oversees the work of candidates for the master's degree.

Advisory Committee: The Graduate Committee approves from the Graduate Faculty a three-member Advisory Committee to supervise a master's degree student. At least one member of the Advisory Committee must be a member of the Graduate Faculty. These Advisory Committees will act on behalf of and report to the program Graduate Committee.

Advisory Committee has the following principal responsibilities:

a. Assist the student in developing a program of study.
b. Advise the student regarding research direction and thesis preparation.
c. Serve as the Examination Committee for the Final Oral Exam, i.e., thesis defense

Enrollment Projections: The program would ideally like to enroll a minimum of 10 students in the Fall of 2012 and increase in increments of 3-5 each year to a maximum of 25 students.

Learning

Scholarship Requirements: To maintain good standing, students are required to maintain a grade point average of at least a B (3.00) in their program of study. A grade of C (2.00) may be accepted for no more than one course; receipt of two grades of C or any grade below C is not acceptable for credit and may result in dismissal from the program. A student who fails to maintain a minimum grade point average of B (3.00) will automatically be on academic probation and may not continue his/her program of study without the permission of the College of Public Health Curriculum Committee. In order to secure this permission, the student, in conjunction with his/her academic advisor, must submit a plan of remediation for approval to the Curriculum Committee at least two (2) calendar weeks prior to the next scheduled Curriculum Committee meeting (Instructions for Developing a Plan of Remediation for Academic Standing-see CoPH Student Handbook for more details). The Curriculum Committee will review the student's status and plan of remediation. To continue in the Masters program, the

student must remove the probationary status (i.e., return to an overall 3.00 or above grade point average) within the next twelve (12) months.

Need for Diverse Student Group: The MSin Emergency Preparedness will follow the UNMC guide for its student diversity, which promotes equal educational and employment opportunities in the academic and work environment. It shall not discriminate against students and employees, and campus visitors (for example, applicants for educational programs, employment applicants, volunteers, and vendors) based on race, age, color, disability, religion, sex, national origin, marital status, genetic information or Veteran status.

Evidence Of Need

Introduction: The United States is part of a global community responding to disasters that may be man-made (terrorism) or natural in origin. Although the response is often tailored to event characteristics, basic concepts are common to all disasters. Given the changing landscape for a secure and prosperous nation, the citizens of this country look to experts in the fields of disaster and emergency preparedness for leadership and guidance in difficult times. A well prepared nation minimizes the impact of such disasters and recovers more quickly and effectively. Leadership that is well equipped with the knowledge and experience to respond to such events is required both globally and in this country. Research to establish evidence-based knowledge is only beginning to emerge. Academic institutions have a responsibility to fill this void and the University of Nebraska Medical Center's College of Public Health, already renowned for its expertise in Biopreparedness and Biosecurity, is emerging as a leader in the endeavor.

Background: All existing academic preparedness programs across the country were studied to determine the strengths and weaknesses of existing curricula. Needs assessment data were collected to determine the educational gaps the MS degree program would fill with its academic content, and the curriculum was designed using expertise from College of Public Health faculty and staff, in addition to regional experts in emergency preparedness content and delivery. Experience was drawn from the Epidemiology course entitled EPI 822: Epidemiology of Biopreparedness, Biosecurity and Emerging Infectious Diseases, which attracted 20 students from both Masters and PhD level programs. Along with four core courses, an 18 credit hour Certificate in Emergency Preparedness was launched in the fall of 2011.

Market Analysis Summary: The overall target customers for this academic program will be drawn from two arenas. The public health work force and health care professionals will comprise the largest pool of professionals from which to draw future students. Current undergraduate students with various backgrounds will be the second sector. Marketing programs will differ between the two populations and strategies will need to be tailored to obtain the best access to prospective students and contain evidence to support their decision to pursue this academic program. A 2005 public health workforce

study in six different states concluded that several factors will influence the marketing of this program. The results cited the lack of advanced education as a barrier to upgrading staff and programs. Emergency response is a relatively new field, so an argument can be made that this program provides the opportunity for professionals in the field to acquire advanced education in a rapidly advancing area. Lack of partnerships with local public health and emergency response agencies also contributes to a lack of collaboration between academic institutions and local agencies. Senior personnel in this area are being lost to retirement in a rapidly aging workforce, creating another opportunity for younger professionals to acquire the specialized advanced education provided by this program.

Target Audience and Marketing Strategies: Currently practicing healthcare providers will comprise an important target audience in both rural and urban settings. Physicians, nurses, and other allied health professionals have the clinical background to appreciate the need for comprehensive education in this area. Hospital accrediting bodies, to include The Joint Commission on Accreditation of Hospitals, have added Emergency Preparedness as a requirement for continued recognition and often make federal funding contingent on successful reviews. Most healthcare facilities have added emergency response personnel to accommodate this requirement. The practice track was designed for this audience. Having an exhibit booth at hospital-based conferences and meetings will ensure access to this market. Hospital associations also provide a conduit to this audience by including program information in electronic educational program catalogs.

Business and industry has also recognized the importance of planning for emergencies in their own environment to ensure continuity of operations, and have consequently added positions to prepare their organizations accordingly. All above audiences have been participants in CBBEID training over the years and will be targeted at future continuing education programs. An annual Preparedness Symposia Series will be the primary target for aggressive recruiting to the program. This conference series is attended by most current professionals in emergency response roles. In Nebraska, few have advanced degrees as academic programs in this area are limited. Other conferences attended by this audience will be pivotal to accessing these professionals and will be forums for exhibiting and promoting the program. Professional organizations for nurses, physicians and other allied health professions also welcome presentations for educational recruitment

Equally important will be the strategies to attract new professionals to the field and experts in academia to conduct research and teaching in this newly emerging topic area. As new career opportunities arise for professionals in Emergency Preparedness that cannot be filled by an aging public health workforce, it will be imperative to recruit from both science based and non-traditional backgrounds among the current student

population. It will also be important to introduce this new field of study to current students who are aspiring to a career in academia and research. Access to this population will be through career fairs at existing undergraduate institutions and information sent to career offices, or through academic counseling for graduate studies

Marketing Strategy and Implementation Summary: All course requirements of the program are complete and approved for launch in the fall of 2012. Marketing for students to enroll in the program will be paramount to a successful beginning. The four core courses and a strong list of elective courses will attract and retain students. Distance learning opportunities are also important as the market for recruiting grows. Marketing the program through conference exhibitor booths will be accomplished through the CBBEID's 2011/2012 conference and program schedule. The CBBEID will also exhibit and market the program at other regional preparedness programs.

Competitive Edge: As the foundation for the MS in Emergency Preparedness, the CBBEID is highly respected for providing comprehensive programs across the state of Nebraska, and throughout the region and nation. Its programs have been recognized nationally with awards such as the Telly® Award for Innovative Educational Videos. Faculty and staff have presented nationally at conferences that range from Emergency Management to specialized clinical venues. Invitations for training and education in international settings (World Disaster Management Conference, Toronto, Canada) and nationally (CDC infectious disease fellow training program in St Louis, Mo in 2011) have also been attributed to an excellent reputation.

This repertoire of educational material, coupled with advanced training in the principles of adult learning and engagement, has positioned the CBBEID as a leader in Emergency Preparedness training and provided educational content and comprehensive academic curriculum.

Adequacy of Resources:

Faculty/Staff – This program will require 3.0 FTE of faculty time at initial program launch. Some faculty time will be needed for an Admission and Program Committee to run the program efficiently. The following faculty will be assigned to this program as of time of launch:

Philip W. Smith, MD: Appointments: Primary COM - Secondary CoPH. Areas of research expertise: Infection control in nursing homes, Biopreparedness
Sharon Medcalf, M Ed: Appointment: CoPH. Areas of research interest: Hospital Preparedness
Peter Iwen, PhD: Appointments: Primary COM - Secondary CoPH. Areas of research expertise: Clinical microbiology, Mycology
Angela Hewlett, MD: Appointments: Primary COM - Secondary CoPH. Areas of research expertise: Orthopedic ID, Biocontainment

Steven Hinrichs, MD: Appointments: Primary COM - Secondary CoPH. Areas of research expertise: Clinical microbiology, Virology.
John Lowe, MS: Appointment: CoPH. Areas of research interest: Decontamination, virology.
Keith Hansen, BA: Appointment (pending): CoPH. Areas of research interest: Preparedness in the Private Sector, Disaster Exercise evaluation
Shawn Gibbs PhD: Appointment : CoPH Department of Environmental, Occupational and Agricultural Health. Will be teaching Foundations of Public Health
KM Monirul Islam, MD, PhD: Appointment: CoPH Department of Epidemiology. Will be teaching both required Epidemiology courses

Program Administration: The Program will be administered by the Program Director along with support from the CoPH Office of Educational Services. Philip Smith, MD, Department of Epidemiology, will serve as Program Director.

Library: All resource materials for Emergency Preparedness topics are currently housed and cataloged with UNMC's McGoogan library and easily accessible to all students

Physical Facilities: The Maurer Center for Public Health will provide the physical facility to offer this program.

Instructional equipment: No additional equipment is necessary for the proposed program.

Budget projections: Budget requirements for the program will consist of additional Center faculty time to be determined in the future by the Dean's office. With regard to tuition, the usual Graduate College tuition rates and fees shall apply. Budget attached.

Admission and Awarding of Degree

Admission Requirements: UNMC policies are in accord with Title VI of the Civil Rights Act of 1964,Title IX of the Educational Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, and Sections 799A and 854 of the Public Health Services Act. See graduate bulletin for greater detail.

ADMISSION TO THE M.S. PROGRAM

- Official transcripts reflecting an earned bachelor's degree, with a 3.0 or higher grade point average for the last 60 undergraduate or the last 18 graduate/post-baccalaureate credit hours completed.
- Official Graduate Record Examination (GRE) scores taken within the last three years.
- Three letters of recommendation from academic or professional references.

- A resume reflecting one or more years of work/volunteer history related to health and/or human services.
- A one-page personal statement.
- Official Test of English as a Foreign Language (TOEFL) scores are required of all applicants whose primary language is not English or whose undergraduate degree is from a college or university outside of the United States.
-

Awarding of Degree: Completion of 36 credits of prescribed course work with a minimum 3.0 GPA, a comprehensive exam, and successful completion, approval, and defense of the MS thesis.

Counting Credits toward Certificate and Degree Programs

Students earning credits for one or more certificates who are later accepted into a CoPH degree program may apply their certificate credits to the extent that they are applicable for that degree. Any limit on internal transfer credits applicable to the degree shall apply. Students earning credits in a CoPH degree program (or in non-matriculated) status who leave prior to earning a degree, may apply to be admitted to a certificate program within two years of separation and, if accepted, may apply their previous earned, applicable credits (Grade B or better) to the certificate.

Partnerships with Businesses: The CBBEID is an active partner with Nebraska's Lieutenant Governor in his role as Director of Homeland Security and his Infrastructure Protection Executive Committee. This committee is comprised of private and public sector businesses. The CBBEID has a lead role in the training programs conducted for these organizations and as such interacts regularly. As a result of this partnership, opportunities for internships and work study programs will be easily facilitated.

Collaborations with University: Currently there are no similar programs within COPH and UNMC. The M.S. program will utilize existing COPH courses as electives.

Collaboration with Higher Education Institutions and Agencies External to the University: The College of Public Health has collaborated with the following educational institutions to partner on continuing education programs and academic-related activities such as Grand Rounds:

Creighton University
Uniformed Services University of the Health Sciences
St. Louis University
University of Iowa
University of Florida
University of North Carolina
Emery University

St. Jude Children's Research Hospital

Since 2002, the CBBEID has partnered closely with the following government agencies for educational programming and preparedness planning activities:

All Nebraska Local Public Health Departments
Nebraska Department of Health and Human Services

- Office of Preparedness
- Office of Public Health
- Office of Minority Health
- Emergency Medical Services Program

Nebraska Emergency Management Agency (NEMA)
Nebraska Volunteer Organizations Active in Disasters (VOAD)
Aberdeen Area Tribal Chairman's Health Board
FEMA Region VII- Division of National Preparedness

Avoidance of Unnecessary Duplication

Similar programs offered within the state:

Bellevue University: Master of Science in Security Management- A program focused on Security management, Counter-Terrorism and Cybersecurity.

Similar programs offered within nearby states that are reasonably accessible to Nebraska residents:

Oklahoma: University of Oklahoma: MPH in Public Health Preparedness and Terrorism
Minnesota: University of Minnesota: Public Health Certificate in Preparedness, Response and Recovery;
North Dakota, Wisconsin, Arkansas, New Mexico, Texas, and Illinois: No Preparedness Programs

Graduate and professional programs in contiguous states reasonably accessible to Nebraska residents:

Colorado, Wyoming, South Dakota, Iowa, Kansas: No Preparedness Programs
Missouri: Saint Louis University - Certificate programs in 1) Biosecurity and Disaster Preparedness or Emergency Management and Crisis Leadership (only online), MS in Biosecurity and Disaster Preparedness (only online), MPH in Biosecurity and Disaster Preparedness (preparedness courses only offered online) and MPH in Emergency Management and Crisis Leadership, PhD in Biosecurity and Disaster Preparedness.

- Nebraska's program will be available *both* on campus and via distance education technology

UNMC College of Public Health's MS in Emergency Preparedness was designed to provide an academic program (available both in-person or via distance education) that is unique and unparalleled in the region. Not only does UNMC's program maintain a purely public health focus, unlike all other programs, but it is modeled after the Department of Homeland Security's Target Capabilities List (TCL) which describes the capabilities related to the four homeland security mission areas: Prevent, Protect, Respond, and Recover. The TCL defines and provides the basis for assessing preparedness and establishes national guidance for preparing the Nation for major all-hazards events. There are no other programs in the region or the country, structured to ensure that all graduates are educated using a model that provides the framework for all public health preparedness activities and associated federal funding.

Consistency with the Comprehensive Statewide Plan for Postsecondary Education

Meeting the needs of Nebraska students

This program will commit to:

- The use of information technologies to expand educational opportunities; overcome geographic barriers; provide high quality, accessible education programs; and make higher education available at nearly any time or any place.
- Use competency-based learning models to meet the needs of adult learners by offering specific components of traditional courses that represent learning objectives and that are in demand by adult learners.
- Ensure that all distance learning programs available result in learning outcomes appropriate to the rigor and breadth of the degrees/certificates awarded.
- Provide interesting, challenging, and rewarding classroom experiences that engage students as active participants in their learning process and motivate them to high achievement.
- Ensure that graduates are competent in areas appropriate to their field of study, as determined through measures identified by the institutions.

Meeting the needs of the state

This program will commit to:

- Effectively recruit and retain more Nebraska students and attract more out-of-state students to the program, especially those students entering targeted career fields that address preparedness workforce needs in Nebraska.

- Align recruitment of students to disciplines and programs with the state's preparedness workforce needs in specific industries and geographic locations across the state.
- Produce graduates with the skills to think critically, communicate effectively, and work collaboratively as members of problem-solving preparedness and response teams in the workplace.
- Enhance collaboration with industry to improve availability and value of in-service training to upgrade the skills of the existing preparedness workforce.
- Explore methods of bringing educational and work experience opportunities to minority populations in their own communities that encourage enrollment in this program.
- Increase awareness of the contributions of UNMC's College of Public Health's research programs to the quality of life in Nebraska to improve the understanding of research activities and to attract increased support for research activities.

<u>Meeting need by building exemplary institutions</u>

This program will commit to:

- Promoting quality and innovation in teaching and learning within each institution's designated role and mission, particularly in areas of importance to the state
- Assessing student learning and using the results to enhance the quality of the students' learning experiences
- Attracting, developing, and retaining high quality faculty and staff members
- Using information technologies and resource sharing to enhance learning opportunities both on- and off-campus
- Conducting analysis and evaluation of the educational and service needs of this program's service area through ongoing dialogue with employers, civic leaders, and citizens
- Expose students to research skills and experiences that are relevant to the Emergency Preparedness field of study and future career goals.

<u>Meeting educational needs through partnerships and collaboration</u>

This program will commit to:

- When possible, partner with other higher education institutions, communities, businesses, and other entities to share facilities, to improve efficiencies, and to accommodate the needs of students and communities
- Partner with the state's employers to provide ongoing training to employees in both rural and urban locales to sustain the workforce's knowledge, skills, and readiness for change.

TABLE 1: PROJECTED PROGRAM EXPENSES - PROPOSAL TITLE: MS Emergency Preparedness

EXPENSES	(FY12) Year 1		(FY13) Year 2		(FY14) Year 3		(FY15) Year 4		(FY16) Year 5		**Total**	
	FTE	COST	FTE	COST	FTE	COST	FTE	COST	FTE	COST	FTE	COST
Personnel:												
Faculty [1]	1.00	$ 65,256	1.00	$ 67,524	1.18	$ 79,417	1.39	$ 93,120	1.62	$ 108,905	1.62	$414,222
Professional [2]	0.05	$ 3,750	0.05	$ 3,863	0.05	$ 3,978	0.05	$ 4,098	0.05	$ 4,221	0.05	$19,909
Graduate Assistants	0.00											$0
Support Staff [3]	0.10	$ 4,200	0.10	$ 4,346	0.18	$ 5,112	0.39	$ 5,993	0.62	$ 7,009	0.62	$26,660
Sub-Total	1.15	$ 73,206	1.15	$ 75,733	1.41	$ 88,507	1.83	$ 103,211	2.29	$ 120,135	2.29	$460,972
Operating												
General Operating [3]	$	10,000		$10,100		$10,201		$10,303		$10,406		$51,010
Equipment												$0
New or renovated space												$0
Library/information Resources												$0
Other												$0
Sub-Total	$	10,000	$	10,100	$	10,201	$	10,303	$	10,406		$51,010
Total Expenses	$	83,206	$	85,833	$	98,708	$	113,514	$	130,541		$511,802

1. Additional Faculty: This represents 1.0 FTE of the average salary of the faculty that will be course instructors with incremental increases according to estimated need.

2. Non-Teaching Staff: This represents 0.05 FTE of Jessica Tschirren, Director of Education Services with a yearly increase of 3%.

3. Support Staff: This represents 0.10 FTE for administrative support with a incremental increases according to estimated need.

4. General Operating Expenses:General operating expenses are incremented at 1% per year.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - PROPOSAL TITLE: MS Emergency Preparedness

REVENUE	(FY12) Year 1	(FY13) Year 2	(FY14) Year 3	(FY15) Year 4	(FY16) Year 5	Total
REALLOCATION OF EXISTING FUNDS [1]	$44,817	$41,686	$47,939	$55,130	$63,399	$189,572
REQUIRED NEW PUBLIC FUNDS						$0
1. State Funds						$0
2. Local Tax Funds Community Colleges)						$0
TUITION AND FEES [2,3]	$38,389	$44,147	$50,769	$58,384	$67,142	$258,831
OTHER FUNDING						$0
1.						$0
2.						$0
3.						$0
*TOTAL REVENUE	$83,206	$85,833	$98,708	$113,514	$ 130,541	$511,802

1. This represents the amount of salary and benefits that the College of Public Health will reallocate from its budget to support this program. The source of funds for this reallocation is comprised of POE and state-aided funds.
2. 10 students first year [5 FT (18 cr hrs/yr), 5 PT (12 cr hrs/yr)]; 60% resident, 40% non-resident; 15% increase per year. Total divided by 0.5.
3. Distributive Learning fee = $25/credit hour

TO:	The Board of Regents	Addendum VIII-A-3
	Academic Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Creation of the Master of Science (MS) in Information Assurance at the University of Nebraska at Omaha (UNO)	
RECOMMENDED ACTION:	Approval is requested to create an MS in Information Assurance at UNO	
PREVIOUS ACTION:	June 14, 2007 – The Board approved a Bachelor of Science in Information Assurance at UNO	
EXPLANATION:	The University of Nebraska at Omaha proposes to establish a Master of Science degree in Information Assurance (IA), the practice of managing information-related risks by ensuring confidentiality, integrity, authentication, availability, and non-repudiation of data. The College of IS&T currently has an undergraduate degree in Information Assurance, with an enrollment that has increased from 32 to 53 during the 2010-11 academic year, and to 74 within the past 12 months. UNO plans to leverage the existing faculty supporting the approved undergraduate degree in Information Assurance in order to provide a Master's degree in this increasingly important area. In addition to the national interest in cybersecurity, Nebraska is the home to many high tech industries (health, insurance, transportation related, etc.) reliant on secure computer infrastructures for their daily operations. Virtually any industry using computers could be subject to a cyber attack, and trained individuals who know what to do are very scarce and a highly sought after resource. The proposed MS in Information Assurance consists of 33 hours of course content with a thesis and non-thesis option. The proposal has been endorsed by the UNO Graduate Council, the NU Council of Academic Officers, and the NU Executive Graduate Council.	
PROJECT COST:	$1,182,519	
SOURCE OF FUNDS:	Reallocation of existing funds	
SPONSORS:	B.J. Reed Senior Vice Chancellor for Academic and Student Affairs John Christensen, Chancellor University of Nebraska Omaha	
RECOMMENDED:	Linda R. Pratt Executive Vice President and Provost Dean of the Graduate College	
DATE:	March 19, 2012	

PROPOSAL FOR THE CREATION OF
A MASTER OF SCIENCE DEGREE IN INFORMATION ASSURANCE (MSIASC)

Proposed by:	The University of Nebraska at Omaha (UNO) Omaha, Nebraska
Proposed program:	Information Assurance
Proposed degree:	Master of Science
Other programs in this field at UNO:	None
CIP code:	111003
Administrative units:	Office of Graduate Studies, School of Interdisciplinary Informatics (SI2), College of Information Science & Technology (IS&T)
Proposed delivery site:	University of Nebraska at Omaha, Omaha, NE
Proposed delivery method:	On campus and distance education
Date approved by governing board:	
Proposed Start Date:	Fall 2012

1. <u>Description and Purpose of the Proposed Program</u>:

The University of Nebraska at Omaha proposes to establish a Master of Science degree in the growing area of Information Assurance (IA). Information Assurance is the practice of managing information-related risks by ensuring confidentiality, integrity, authentication, availability, and non-repudiation of data. The College of IS&T currently has an undergraduate degree in Information Assurance, with an enrollment that has increased from 32 to 53 during 10-11 academic year, and to 74 within the past 12 months. There are an additional approximately 50 students currently enrolled in either Computer Science (CS) or Management Information Systems (MIS) who are pursuing a concentration in IA. UNO plans to leverage the existing faculty supporting the undergraduate degree in order to provide a Master's degree in this increasingly important area. There are no additional faculty or lab costs associated with the new degree since the staff and facilities are already in place.

There is a tremendous demand for information assurance and for information security professionals in the United States at this time; the Bureau of Labor Statistics has stated[1]:

- "Growth in computer support specialist jobs will be about as fast as the average, while growth in network and computer system administrator jobs will be much faster than average"
- "Employment of computer support specialists and systems administrators is expected to increase by 18 percent from 2006 to 2016, which is much faster than the average for all occupations."
- "Employment of computer support specialists is expected to increase by 13 percent from 2006 to 2016, which is about as fast as the average for all occupations."
- Employment of network and computer systems administrators is expected to increase by 27 percent from 2006 to 2016, which is much faster than the average for all occupations.
- "Demand for computer security specialists will grow as businesses and government continues to invest heavily in "cybersecurity," protecting vital computer networks and electronic infrastructures from attack. The information security field is expected to generate many new system administrator jobs over the next decade as firms across all industries place a high priority on safeguarding their data and systems."

The U.S. Department of Homeland Security (DHS) plans to hiring 1,000 cyber security experts over the next three years; "Cybersecurity is one of our most urgent priorities," according to Homeland Security Secretary Janet Napolitano[2].

Mr. George Bieber,current Chief of Information Assurance Education, Training, Awareness and Products in the IA Program Management Office of the Defense Information Systems Agency, visited UNOin November of 2010 and while meeting with faculty stated that graduates from UNO'sundergraduate Information Assurance program were "tied with the best, or even better, in terms of quality, but others have you beat in terms of quantity". He stated that he could place "as many students, both undergraduate *and graduate*, as we could manage to pass through our program".

[1] "Computer Support Specialists and Systems Administrators" (O*NET 15-1041.00, 15-1071.00, 15-1071.01), http://www.bls.gov/oco/ocos268.htm and http://www.bls.gov/oco/pdf/ocos268.pdf

[2] "DHS to hire up to 1,000 cybersecurity experts", CNN Politics, http://www.cnn.com/2009/POLITICS/10/02/dhs.cybersecurity.jobs/index.html

UNO already has Information Assurance *concentrations* in place at the graduate level. Students can earn a master's degree in Computer Science with an IA concentration, or a Management Information Systems degree with an IA concentration. However there is a growing demand for an IA master's degree in addition to the concentrations. Students have expressed an interest and many would prefer that the degree actually be an IA degree rather than a CS or MIS degree. At the same time, this degree would supplement, not replace, the concentrations already in place within the college. Students currently enrolled, and those who prefer the currently available options, can continue.

In addition to the national interest in cybersecurity, local businesses are increasingly reliant on secure computer infrastructures for their daily operations. Nebraska is the home of many high tech industries including eBay, PayPal, ConAgra, and others in the Fortune 500. Nebraska is also home to numerous other industries where security is paramount due to the confidentiality of the data involved. There are a number of insurance-related industries in Nebraska, as well as the presence of Union Pacific which at any given time may be carrying critical cargo. Trade and industrial secrets are central to the health of companies, and affect employers such as First National Bank. Transaction security and identity theft are important topics to First Data Resources, and voting integrity and correct secret tabulation of election data is of utmost concern for Election Systems and Software. Virtually any industry using computers could be subject to a cyber attack, and trained individuals who know what to do are very scarce and a highly sought after resource.

Currently, the University of Nebraska at Omaha College of Information Science and Technology houses NUCIA, the Nebraska University Center for Information Assurance, one of the Academic Centers of Excellence supported by the National Security Agency. NUCIA staff includes terminal degreed Information Assurance experts and certified information security professionals with industry background. Additionally, the current NUCIA facilities are available and can be used for the majority of new courses in the new degree program. It is clear UNO possesses both the existing expertise and infrastructure to offer the Master of Science Degree in Information Assurance.

As mentioned above current undergraduate IA enrollment is steadily increasing, as well as the number of students in the associated CS and MIS programs who seek Information Assurance concentrations or certifications. But the demand is outpacing the supply at this time, and these students, many of whom graduate and fill key positions within government agencies, currently have no means to pursue post-graduate IA education within the University of Nebraska system. Adding a Master's degree in addition to the existing IA undergraduate program will allow these students to continue their education. With this Master's degree in place, a five-year undergraduate/graduate degree will also be offered.

Computer Science and Management Information Systems have Information Assurance concentrations in place at the master's degree level. In these cases the students take a core of the necessary coursework along with IA electives. Under the proposed degree, the students who are definitely interested in working in the IA arena could reverse this process and take a core of Information Assurance, as well as CS and/or MIS as needed. However the new IA degree program will not greatly impact either of the two existing programs because the students will still be required to take selected core courses in these areas, either under the "Systems" or "Management" tracks proposed below. Also, the Information Assurance degree differs from both of the concentrations in the depth of knowledge specific to the IA domain. For example a CS degree with an IA concentration has a background in programming languages, databases, and others, with a few IA classes. The IA master's has a complementary focus, a heavy emphasis on the Information Assurance subject, with the necessary CS or MIS necessary to back up the discipline.

The existing undergraduate program enjoys important partnerships with organizations external to the University. These partnerships are critical to keeping students abreast of the latest IA issues and will benefit our future Master's students in the same way. NUCIA fosters excellent working relationships with US Strategic Command and Pacific Northwest National Laboratories. NUCIA also conducts research related to local utilities such as Metropolitan Utilities District and Omaha (and Nebraska) Public Power. Ongoing relationships with these entities are crucial to the success of the IA program, and will also be leveraged for the Master of Science degree.

The Information Assurance discipline is many-faceted and integrates a diverse set of disciplines in addition to computer security. For example, IA touches upon criminal justice in seeking a trail of evidence for computer data. IA blends with mathematics where encryption is a necessary technology, particularly with the recent advent in wireless communications. IA relates to computer science in such topics as file systems and fault-tolerant computing (availability). IA impacts Management Information Systems via enforcement of the Sarbanes-Oxley Act of 2002 and via confidentiality requirements for HIPAA medical records. IA infuses accounting in the area of forensics. Finally, IA is utilized in computer engineering, as a communications channel is only secure if the hardware is secure. In short, there is a necessary level of collaboration and coordination between the IA degree program and many other units within the University system. The degree program outlined here reflects this, with some courses being offered through Computer Science or Management Information Systems. The degree program will necessitate working closely with Accounting, Computer Engineering and others to ensure the most up-to-date information is presented in the course work where it crosses these inter-disciplinary boundaries.

Because of the wide variety of subject areas to which Information Assurance can be applied, the proposed degree has been constructed to have two different paths, one based on a strongly technical approach and the other based on a management and policy approach. The former focuses more extensively on technology issues, such as encryption, malware, secure software, and the theoretical background of information security. The latter focuses on another equally important part of IA: the creation of policies necessary for assurance, how to enforce these policies, disaster recovery techniques, and critical business systems practices. Each of the paths requires a 33 hour program of study, and both share a set of common courses that will encompass the majority of the Information Assurance common Body of Knowledge. In addition, non-core courses are designed to allow students to explore a wide variety of areas to which the core concepts are applicable, such as information warfare, forensics, software reverse engineering, secure software engineering, corporate information technology security policy management, and many more.

The degree program has a "thesis" option and a "capstone" option. Students who want to actively engage in IA research, write the results of the research and potentially contribute to knowledge in the subject area will choose a thesis. Students who are interested in pursuing a PhD are also thesis-option candidates. Students who desire a more practical education, who potentially see themselves as IA professionals, will choose the capstone option. Here, the students are required to take a capstone class in which they will work with on practical research problem related to current IA issues, and will present their research results, but are not expected to write a full thesis on the work.

Finally we point out that NUCIA has the capability to provide two year "full ride" scholarships for qualified students under the National Science Foundation "Federal Cyber Service: Scholarship for

Service" program[3]. This program gives the students free tuition, room and board, a stipend, and computing facilities (laptop) and also aligns students with federal agencies for internships. The students in turn "pay back" the funding by agreeing to work for a federal agency for an equal duration upon graduation. UNO has already managed 35 students through the program and the funding is available at all university education levels, including graduate degrees.

The remainder of the proposal details the program of study, the two concentrations and the two options, and in general shows the proposed program and reflects the current state of the art in the Information Assurance discipline.

2. Program of Study

2a. Overview

The proposed Master of Science in Information Assurance degree consists of 33 hours of course content. If a student elects the thesis option, the student has a requirement of 27 hours of content plus 6 hours of thesis work.

This degree allows the College of IS&T to offer a Master of Science in Information Assurance along with an integrated undergraduate and graduate degree once the MS in IA is approved. the integrated program will be a five-year undergraduate/graduate program. Because of the integrated program, there are several Information Assurance classes which are cross-listed as both Undergraduate and Graduate.

This degree has two concentrations: 1) systems, the technology based track, and 2) management and policy, as shown in the following tables:

[3] https://www.sfs.opm.gov/

Master of Science in Information Assurance Thesis Option	
Prerequisites: Programming in C or C++, Networking **(CSCI 1840 or 2840 or equivalent, CSCI 3550 or ISQA 3400 or equivalent)**	
Core Courses **9 Credit Hours**	
IASC 8366 – Foundations of Information Assurance	
IASC 8410 – Distributed System and Network Security	
ISQA/IASC 8546 – Computer Security Management	
Systems Concentration **12 Credit Hours**	**Management and Policy Concentration** **12 Credit Hours**
IASC 8420 – Software Assurance	**ISQA/IASC 8530** – E-Commerce Security
CSCI 8610 – Fault Tolerant Distributed Systems	**ISQA/IASC 8570** – Information Security Policy and Ethics
IASC 8386 – Computer and Network Forensics	**ISQA/IASC 8580** – Security Risk Analysis & Management
IASC 8356 – Advanced Vulnerability Discovery	**IASC 8510** – Information Technology Governance and Compliance
Electives **Choose 6 Credit Hours**	**Electives** **Choose 6 Credit Hours**
CSCI/IASC 8440 – Secure Systems Engineering	**IASC 8440** – Secure Systems Engineering
CSCI 8430 – Trusted System Design, Analysis, and Development	**CSCI 8430** – Trusted System Design, Analysis, and Development
CSCI 8530 – Advanced Operating Systems	**CSCI 8530** – Advanced Operating Systems
CSCI 8566 – Number Theory and Cryptography	**CSCI 8566** – Number Theory and Cryptography
IASC 8080 – Special Topics	**CSCI 8610** – Fault Tolerant Distributed Systems
IASC 8456 – Host-Based Vulnerability Discovery	**IASC 8080** – Special Topics
IASC 8490 – Advanced Computer Forensics	**IASC 8356 –** Advanced Vulnerability Discovery
IASC 8510 – Information Technology Governance and Compliance	**IASC 8386** – Computer and Network Forensics
IASC 8520 – Business Continuity & Disaster Plan'g	**IASC 8420** – Software Assurance
IASC 8900 – Independent Study	**IASC 8490 –** Advanced Computer Forensics
ISQA/IASC 8530 – E-Commerce Security	**IASC 8900 –** Independent Study
ISQA/IASC 8560 – Information Warfare and Security	**ISQA 8060** – Research Methods
ISQA/IASC 8570 – Information Security Policy and Ethics	**IASC 8520** – Business Continuity & Disaster Plan'g
ISQA/IASC 8580 – Security Risk Analysis & Management	**ISQA/IASC 8560** – Information Warfare and Security
ISQA 8596/ACCT 8096 - IT Audit and Control /Information System Auditing	**ISQA 8596/ACCT 8096** – IT Audit and Control /Information System Auditing
IASC 8990 – Thesis **6 credit hours**	

This program of study is subject to change over time as the program develops.

Master of Science in Information Assurance Coursework Option	
Prerequisites: Programming in C or C++, Networking **(CSCI 1840 or 2840 or equivalent, CSCI 3550 or ISQA 3400 or equivalent)**	
Core Courses **9 Credit Hours**	
IASC 8366 – Foundations of Information Assurance	
IASC 8410 – Distributed System and Network Security	
ISQA/IASC 8546 – Computer Security Management	
Systems Concentration **15 Credit Hours**	**Management and Policy Concentration** **15 Credit Hours**
IASC 8420 – Software Assurance	**ISQA/IASC 8580** – Security Risk Analysis and Management
CSCI 8610 – Fault Tolerant Distributed Systems	**ISQA/IASC 8530** – E-Commerce Security
IASC 8386 – Computer and Network Forensics	**ISQA/IASC 8560** – Info. Warfare and Security
IASC 8356 – Advanced Vulnerability Discovery	**ISQA/IASC 8570** – Info. Security Policy and Ethics
CSCI 8566 – Number Theory and Cryptography -or- **CSCI 8530** – Advanced Operating Systems	**IASC 8520** – Business Continuity and Disaster Planning
Electives **Choose 6 Credit Hours**	**Electives** **Choose 6 Credit Hours**
IASC 8440 – Secure Systems Engineering	**IASC 8440** – Secure Systems Engineering
CSCI 8430 – Trusted System Design, Analysis, and Development	**CSCI 8430** – Trusted System Design, Analysis, and Development
CSCI 8530 – Advanced Operating Systems (unless taken as concentration)	**CSCI 8530** – Advanced Operating Systems
CSCI 8566 – Number Theory and Cryptography (unless taken as concentration)	**CSCI 8566** – Number Theory and Cryptography
IASC 8080 – Special Topics	**CSCI 8610** – Fault Tolerant Distributed Systems
IASC 8456 – Host-Based Vulnerability Discovery	**IASC 8080** – Special Topics
IASC 8510 – Info. Technology Governance and Compliance	**IASC 8356 –** Advanced Vulnerability Discovery
IASC 8520 – Business Continuity & Disaster Plan'g	**IASC 8386** – Computer and Network Forensics
IASC 8900 – Independent Study	**IASC 8420** – Software Assurance
ISQA/IASC 8530 – E-Commerce Security	**IASC 8490 –** Advanced Computer Forensics
ISQA/IASC 8560 – Information Warfare and Security	**IASC 8900 –** Independent Study
ISQA/IASC 8570 – Information Security Policy and Ethics	**ISQA 8060** – Research Methods
ISQA/IASC 8580 – Security Risk Analysis & Management	**ISQA 8596/ACCT 8096** – IT Audit and Control /Information System Auditing
ISQA 8596/ACCT 8096 - IT Audit and Control /Information System Auditing	
IASC 8950 – Capstone in Information Assurance 3 credit hours	

This program of study is subject to change over time as the program develops.

2.b Admission Requirements

1. Complete and submit the graduate application form for admission.
2. Submit a detailed resume indicating your work experience and background.
3. Submit a writing sample from work or previous academic experiences. Alternatively, if you do not have a writing sample, please submit a two-page double-spaced word-processed essay that addresses the following two topics:
   A. Discussion of two accomplishments that demonstrate your potential for success in the graduate program
   B. Discussion of your unique personal qualities and life experiences that distinguish you from other applicants to our graduate program.
4. Ask three references who can evaluate your work and/or academic achievements to write a letter of recommendation on official letterhead and send it directly to the Office of Graduate Studies.
5. Send official transcripts of all college coursework. The minimum undergraduate grade point average requirement for the MS in IASC program is 3.00 or equivalent score on a 4.00 scale. All applicants must have the equivalent of a 4-year undergraduate degree.
6. International applicants who do not have a baccalaureate or equivalent degree from an English-speaking institution of higher education in the United States, the United Kingdom, Canada, English-speaking Africa, Australia, Ireland or New Zealand are required to submit TOEFL and GRE scores.
   A. The minimum TOEFL requirement for the MS in IA program is 550 (paper-based) / 213 (computer-based) / 79 (Internet-based).
   B. There is no minimum GRE requirement, but the applicant's score will be one factor used in evaluating the student's portfolio. The GRE test requirement is waived if: the student is a graduate of the University of Nebraska system with a degree in Computer Science or Management Information Systems and a GPA of 3.5 or more, or the student has earned an M.S. or advanced degree in a closely-related discipline.
7. Interview (optional): Although not required, applicants are strongly encouraged to arrange for an interview with one or more members of the Graduate Program Committee by directly contacting the Committee Chairperson. Telephone interviews are highly recommended for applicants outside the local area.

Admission Criteria:

All applicants are considered on an individual basis. All applicants for the MS in IASC program must have earned a bachelor's degree from a regionally-accredited four-year institution of higher learning or the equivalent foreign institution and earned a GPA of 3.00 (on a 4.00 scale). Since many factors influence the success of a graduate student, factors such as an applicant's maturity, motivation, employment history, writing samples, work experience, and other accomplishments will also be considered in making admission decisions. In addition, for International applicants, the GRE and TOEFL scores will be used along with other factors outlined above to make an admission decision.

Prerequisite knowledge and courses ensure all students in the MS IASC program have a solid groundwork upon which to build the rest of the program. These courses not only provide essential skills for other courses in the program, but they also contain a distinct body of knowledge that is an important part of the IA professional's education. All prerequisite courses are required for all students. However, students who have obtained an undergraduate IA degree will typically already have this knowledge. In such a case, most, if not all, prerequisite courses are usually waived. Students with undergraduate degrees in other disciplines, including Computer Science, Management Information Systems, or Engineering, will usually require one or more prerequisite courses. Occasionally, a student's work experience may be sufficient to waive one or more of these courses.

Waivers for prerequisite courses are granted by the chair of the graduate program committee upon the recommendation of the faculty member who is responsible for an individual course. Students requesting a waiver for a particular course should be prepared to meet with a faculty member and answer questions in the knowledge area of the prerequisite. They should bring to the meeting any relevant transcripts, course syllabi, course material, or evidence of practical experience. Some prerequisite courses may have an option for testing out.

Prerequisite courses cannot be used to satisfy the 33 semester hours required for the MS in IASC degree. Students who have not completed all the prerequisite course requirements may be admitted on a provisional status until those requirements have been completed. All prerequisite courses must be completed prior to or concurrent with the first six hours of MS in IASC graduate course work.

Barring prerequisite knowledge on the part of the student, courses necessary for entry into the MS in IA include:

- For IASC 8366 – Foundations of Information Assurance: IASC 3600 Information Security and Policy
- For IASC 8386 – Computer and Network Forensics: CSCI 3550 - Communication Networks or ISQA 3400 - Business Data Communications
- For CSCI 8610 Fault Tolerant Distributed Systems: CSCI 4500 Operating Systems and CSCI 4350 Computer Architecture
- For ISQA/IASC 8530 – E-Commerce Security: CIST 3100 Organizations, Applications, and Technology and ISQA 8310 Data Communications.
- For ISQA/IASC 8570 – Information Security Policy and Ethics: CIST 3100 Organizations, Applications, and Technology or BSAD 8030, and ISQA 8040 An Overview of Systems Development
- For ISQA/IASC 8580 – Security Risk Analysis & Management: SQA 8060 Research in Management Information Systems and ISQA 8540 Computer Security Management or equivalents

The Graduate College's Quality of Work standards shall be applied to prerequisite courses as well as courses taken as part of the degree program. In particular, the GPC will recommend to the Graduate College that any

1. Student receiving a grade of "C-"or below on any prerequisite course will be dismissed from the program or, in the case of unclassified or non-degree students, be automatically denied admission.
2. Student receiving a grade of "C+" or "C" in any prerequisite course will be placed on probation or dismissed from the program.
3. Student not maintaining a "B" (3.0 on 4.0 scales) average in prerequisite courses will be placed on probation or dismissed from the program.

NON-DEGREE STUDENTS: Students interested in taking courses without admission to the MS in IASC degree program may do so with permission of the Graduate Program Committee.

Programs of Study – Thesis Option

Typical Program of Study	
Master of Science in Information Assurance, Thesis Option, Systems Track	
Fall Semester, Year 1	**IASC 8366** – Foundations of Information Assurance (FCC)
	IASC 8386 – Computer and Network Forensics (SCC)
	ISQA/IASC 8546 – Computer Security Management (FCC)
Spring Semester, Year 1	**IASC 8420** – Software Assurance (SCC)
	CSCI 8610 – Fault Tolerant Distributed Systems (SCC)
	IASC 8410 – Distributed System and Network Security (FCC)
Fall Semester, Year 2	**IASC 8356 –** Advanced Vulnerability Discovery (SCC)
	IASC 8990 – Thesis
	IASC 8990 – Thesis
Spring Semester, Year 2	Information Assurance Elective (SE)
	Information Assurance Elective (SE)

Typical Program of Study	
Master of Science in Information Assurance, Thesis Option, Management and Policy Track	
Fall Semester, Year 1	**IASC 8366** – Foundations of Information Assurance (FCC)
	Information Assurance Elective (MPE)
	ISQA/IASC 8546 – Computer Security Management (FCC)
Spring Semester, Year 1	**ISQA/IASC 8530** – E-Commerce Security (MPCC)
	ISQA/IASC 8570 – Information Security Policy and Ethics (MPCC)
	ISQA/IASC 8580 – Security Risk Analysis & Management (MPCC)
Fall Semester, Year 2	**IASC 8510** – Information Technology Governance and Compliance (MPCC)
	IASC 8990 – Thesis
	IASC 8990 – Thesis
Spring Semester, Year 2	Information Assurance Elective (MPE)
	IASC 8410 – Distributed System and Network Security (FCC)

Legend: Fixed Core Courses (FCC), Management and Policy Core Courses (MPCC), Systems Core Courses (SCC), Management and Policy Electives (MPE), and Systems Electives (SE)

Programs of Study – Coursework Option

Typical Program of Study	
Master of Science in Information Assurance, Coursework Option, Systems Track	
Fall Semester, Year 1	**IASC 8366** – Foundations of Information Assurance (FCC)
	IASC 8386 – Computer and Network Forensics (SCC)
	ISQA/IASC 8546 – Computer Security Management (FCC)
Spring Semester, Year 1	**IASC 8420** – Software Assurance (SCC)
	CSCI 8610 – Fault Tolerant Distributed Systems (SCC)
	IASC 8410 – Distributed System and Network Security (FCC)
Fall Semester, Year 2	**IASC 8356** – Advanced Vulnerability Discovery (SCC)
	CSCI 8566 – Number Theory and Cryptography (SCC) or **CSCI 8530** – Advanced Operating Systems (SCC)
	Information Assurance Elective (SE)
Spring Semester, Year 2	**IASC 8950** – Capstone in Information Assurance
	Information Assurance Elective (SE)

Typical Program of Study	
Master of Science in Information Assurance, Coursework Option, Management and Policy Track	
Fall Semester, Year 1	**IASC 8366** – Foundations of Information Assurance (FCC)
	ISQA/IASC 8560 – Information Warfare and Security or Information Assurance Elective (MPE)
	ISQA/IASC 8546 – Computer Security Management (FCC)
Spring Semester, Year 1	**ISQA/IASC 8580** – Security Risk Analysis and Management (MPCC)
	ISQA/IASC 8530 – E-Commerce Security (MPCC)
	ISQA/IASC 8560 – Information Warfare and Security or Information Assurance Elective (MPE)
Fall Semester, Year 2	**ISQA/IASC 8570** – Information Security Policy and Ethics (MPCC)
	IASC 8520 – Business Continuity and Disaster Planning (MPCC)
	Information Assurance Elective (MPE)
Spring Semester, Year 2	**IASC 8950** – Capstone in Information Assurance
	IASC 8410 – Distributed System and Network Security (FCC)

Legend: Fixed Core Courses (FCC), Management and Policy Core Courses (MPCC), Systems Core Courses (SCC), Management and Policy Electives (MPE), and Systems Electives (TE)

3. **Faculty, Staff, and Other Resources**

3a. Number of faculty and staff required to implement the proposed program

Shown below is a list of the current faculty who are involved in teaching courses related to the Information Assurance discipline within the college. This list is sufficient for teaching the coursework within the proposed master's degree; the intention is to *reallocate current faculty lines and funds from grants/F&A to support the program*. No existing programs and functions will be impacted by these reallocations since faculty lines previously utilized primarily for outreach and infrastructure set-up can now be assigned to teaching loads. While additional course materials will need to be developed in some cases for the master's degree, the current faculty will be utilized to develop this material.

Faculty	Rank	Area of Expertise/Coursework
Azad Azadmanesh, PhD	Professor	CSCI 8610 – Fault Tolerant Distributed Systems
Blaine Burnham, PhD	Advisor/Consultant	Guest Lecturer
Ken Dick, PhD	Senior Research Fellow	IASC 8410 – Distributed System and Network Security IASC 8386 – Computer and Network Forensics IASC 8490– Advanced Computer Forensics
Robin Gandhi, PhD	Assistant Professor	IASC 8420 – Software Assurance IASC 8366 – Foundations of Information Assurance IASC 8440 – Secure Systems Engineering
Deepak Khazanchi, PhD	Professor	ISQA 8596 – IT Audit and Control
Dwight Haworth, PhD	Associate Professor	IASC 8520 – Business Continuity and Disaster Planning ISQA/IASC 8530 – e-Commerce Security ISQA/IASC 8560 – Information Warfare and Security ISQA/IASC 8546 – Computer Security Management
William Mahoney, PhD	NUCIA Director and Assistant Professor	IASC 8356 – Advanced Vulnerability Discovery IASC 8456 – Host-Based Vulnerability Discovery IASC 8950 – Capstone in Information Assurance
Abhishek Parakh	Assistant Professor	IASC 8080 – Special Topics (new faculty at the time of this writing, will be developing curricula in Cloud Computing and encryption)
Leah R. Pietron, PhD, CISA	Associate Professor	IASC 8510 – Information Security Governance and Compliance ISQA/IASC 8570 – Information Security Policy and Ethics ISQA/IASC 8580 – Security Risk Analysis and Management
Kerry W. Ward, PhD, CPA	Assistant Professor	ISQA 8060 – Research Methods
Stanley Wileman	Professor	CSCI 8530 – Advanced Operating Systems
Victor Winter, PhD	Associate Professor	CSCI 8430 – Trusted System Design, Analysis, and Development
Jong-Hoon Youn, PhD	Associate Professor	IASC 8410 – Distributed System and Network Security
IA Faculty on an "As needed" basis:		IASC 8080 – Special Topics IASC 8900 – Independent Study

	IASC 8950 – Capstone in Information Assurance IASC 8990 – Thesis
Accounting:	ISQA 8596 – IT Audit and Control
Mathematics:	CSCI 8566 – Number Theory and Cryptography

Staff

- Connie Jones – Instructor, Information Assurance and College if IS&T
- Steve Nugen – Senior Research Fellow, Information Assurance, CISSP, IAM, IEM

3b. Additional Physical Facilities Needed

The College of IS&T has state of the art laboratories and facilities to fulfill the needs of the new graduate program with no major additions anticipated at this time.

3c. Instructional Equipment and Informational Resources

The three Security Technology Education and Analysis Laboratories (STEALs) form the physical backbone of NUCIA research efforts. All three labs are managed by the College. STEAL1 is a sandbox laboratory; a 24/7 laboratory dedicated to independent research and class- related problems. For research purposes, the room has its own internal, reconfigurable network which is isolated from the rest of the University network infrastructure. The computing facilities are designed for flexibility, with each device able to assume many roles, served by a state-of-the-art configuration server. Using this isolation and flexibility, students and faculty can explore a number of ideas and implementations that may be considered too dangerous or disruptive to perform in a more public laboratory environment. Further, the "open lab" design allows students freedom of inquiry, while the isolation allows them to prevent others from potentially being harmed by their work. This lab is a critical resource for the Master's program as it allows students and faculty to create and experiment in a "hands on" manner.

STEAL2 is a 28-seat teaching laboratory designed with the same flexibility and isolation properties built into STEAL1. STEAL2 and STEAL1 can be connected via network in the event more seats or resources are necessary for a specific class or topic. The STEAL2 teaching laboratory allows students to participate in hands-on exercises that stress both the principles and the practical implementation details of the concepts learned in their Information Assurance classes. Classes that meet in STEAL2 include Computer Forensics, Windows System Administration, Linux System Administration, Introduction to Information Assurance, and others. To crown its capabilities, STEAL2 boasts a complete audio/visual tool set for state-of-the-art presentations, and has been used to host many dignitaries from Nebraska, all over the U.S., and even from Europe and Japan. The room hosts the International Cyber Defense Workshop, held twice a year, for the Department of Defense. This exercise is managed by NUCIA within the College of IS&T. STEAL2's main feature, more important than the technology itself, is the built-in ability for students to collaborate on laboratory assignments by sharing their computing resources with one another seamlessly. The immediately reconfigurable nature of the room makes for a dynamic classroom experience that both challenges and engages the students.

STEAL3 is a combination office and meeting space for Information Assurance students. It is intended to foster a community of students, with the hope that the community will become self-sustaining/renewing as time goes on. Faculty, particularly those in the IA area, often spend time in

STEAL3 talking and working with the students, nurturing even tighter relationships and building enthusiasm for the research projects NUCIA undertakes.

3d. Budget Projections

The proposed degree will not require any additional faculty. We currently have adequate FTEs in the IASC program to meet the needs of the degree. We plan on reallocating 1.4 FTE for delivering the graduate program. This estimation is based on the basis of two half-time tenure track faculty and .4FTE for a research fellow in the IA program reallocated to this graduate program. Two graduate assistants will be hired using reallocated funds, grants and increased tuition revenue. The 0.25 FTE staff person will be financed from reallocated staff funding already available to the school of interdisciplinary informatics. We calculated additional tuition revenue based on five new students (four resident and one non-resident) taking nine credit hours per semester in FY 2011-12, multiplied by resident tuition and fees and increased by 4%each year. We anticipate increasing enrollment and adding at least five (4+1 again) additional students per year reaching a steady state of 25 in FY 2015-16. Tuition rates for FY 2011-12 are as follows: $236.50/credit hour (Resident); $622.50/credit hour (Non-Resident). The college already has extensive IA related laboratories funded from research grants and no additional funding is needed for equipment and labs at this time.

4. **Evidence of Need and Demand: Enrollment Projections**

4a. Need for the Program

The Nebraska University Center for Information Assurance has been named a Center of Academic Excellence in Information Assurance by the Department of Homeland Security (DHS) and the National Security Agency (NSA). These entities created the credential under the auspices of Presidential Decision Directive 63 (PDD63), the National Policy on Critical Infrastructure Protection, published in May of 1998. In PDD63 the president's working group states: "The United States possesses both the world's strongest military and its largest national economy. Those two aspects of our power are mutually reinforcing and dependent. They are also increasingly reliant upon certain critical infrastructures and upon cyber-based information systems." The threat to these cyber-based information systems is the focus of Information Assurance today.

This focus in Information Security is also reflected in the United States Bureau of Labor Statistics Occupational Outlook Handbook for 2008, which states *"**Employment change.** Employment of computer support specialists and systems administrators is expected to increase by 18 percent from 2006 to 2016, which is much faster than the average for all occupations. In addition, this occupation is expected to add 155,000 jobs over the projection decade"*. Furthermore, the handbook contends, "*Demand for computer security specialists will grow as businesses and government continue to invest heavily in "cyber security," protecting vital computer networks and electronic infrastructures from attack. The information security field is expected to generate many new system administrator jobs over the next decade as firms across all industries place a high priority on safeguarding their data and systems".* Clearly the federal government has seen a marked increase in the need for Information Assurance professionals in the market place.

To estimate the projected need for Information Assurance professionals in Nebraska, it is important to understand the sheer scope of the businesses present in Nebraska. Nebraska hosts the world headquarters for five Fortune 500 businesses, and employs some 50,000 workers in the financial sector

alone. With many large-scale businesses moving into the Omaha area, such as E-bay, PayPal, and Google, the need for solid Information Assurance professionals is only expected to rise. In addition, the United States Strategic Command, located just south of the greater Omaha area, holds the computer network attack and defense missions for the United States military. The US Strategic Command is always in need of Information Assurance professionals, whether working directly for the government in a civilian capacity, or for one of the dozens of major contracting companies, such as Booz-Allen Hamilton, Northrop Grumman, or Lockheed Martin. The need for sustaining and continuously training an Information Assurance workforce is now more crucial than ever due to the continually changing nature of threats to information systems. It is common for most local industries to offer incentives for higher and continuing education to employees. In response to high demands for IA professionals in the Omaha area, UNO Chancellor John Christensen told the Midlands Business Journal on December 28th, 2008,"We worked very hard to grow a very high quality program in Information Assurance… a program which is absolutely critical to business and industry, as well as education and government." The need for IA professionals locally is also apparent from the available internship opportunities. Roughly 25% of all IT related internships offered through the Peter Kiewit Institute Career Resource Center require some sort of Information Assurance-related function.

At least 15% of the graduate students enrolled in the College of Information Science and Technology have declared Information Assurance concentrations as part of their course of study. We also see a significant rise in the enrollment of students in the recently implemented Bachelors of Science in Information Assurance program. It is estimated that 25% of the undergraduate students seeking curriculum advice have expressed a desire to join a graduate IA program if one were available in the college. These statistics demonstrate immediate and consistent demand for the Information Assurance degree at the graduate level. In addition to local resources, the College's matriculation agreement with the National Defense University (NDU) provides a steady stream of Department of Defense personnel into the program.

It is therefore imperative for Nebraska to create and sustain a long-term investment in Information Assurance to support the investors in our local economy. A Master's Degree in Information Assurance will provide a credential to assure employers they are receiving exceptional employees with the most advanced knowledge possible. The MSIA will echo the emphasis placed on creativity, independent thought and research that is a hallmark of all Master's Degree programs at the University of Nebraska at Omaha. This will ensure our graduates embody the innovative spirit to propel business and economy well into the future. The Peter Kiewit Institute is used as a recruiting tool by Chambers of Commerce around the state. An MSIA program at UNO would build the Chambers' persuasive power to convince more businesses to relocate to our state, by demonstrating the availability of a highly-educated Information Technology and Assurance workforce.

4b. Employment and Educational Advancement Opportunities for Graduates

Information assurance skills are in high demand due to critical organizational needs for securing their information systems and data. One example is Raytheon, a Department of Defense contractor; they are looking for 1,500+ security professionals over the next 2 years. Several large, local companies with IA needs, such as Union Pacific Railroad, ConAgra, Solutionary, STRATCOM, World Herald, First Data Resources, and First National Bank, are hiring our undergraduates, and would be pleased to see them seek even higher education. Most of these institutions offer excellent incentives to do so.

To demonstrate the demand for Information Assurance professionals, the following table briefly reports the outcome for students who have graduated from the college with a concentration in IA or a bachelor's degree in IA. Student names are omitted. Because this list reflects those who utilized our Scholarship for Service monies, the placement is more heavily into federal agencies in the following table:

College of IS&T Information Assurance Concentration or Undergraduate Degree Students		
Student	**Graduated**	**Outcome**
Student 1	Released	Released from Program
Student 2	May 2006	NSA
Student 3	May 2005	NSA
Student 4	Aug 2006	DOT Office of the Inspector General
Student 5	May 2006	Army: Global Net. Operations and Security Center
Student 6	May 2006	Released via NSF - no placement information
Student 7	May 2006	NSA
Student 8	May 2007	NSA
Student 9	Pending	CISCO: did not graduate, August '-06
Student 10	May 2006	Army CEDEC
Student 11	May 2006	NSA
Student 12	May 2006	US-STRATCOM
Student 13	May 2006	NSA
Student 14	May 2006	US-STRATCOM
Student 15	May 2007	Dept of Treasury
Student 16	May 2007	NSA
Student 17	May 2009	DISA, moving to STRATCOM
Student 18	May 2008	Dept of Commerce
Student 19	May 2008	Dept of Commerce
Student 20	May 2007	Air Force
Student 21	May 2007	US-STRATCOM
Student 22	May 2008	Deferred: Northeastern University, Grad School
Student 23	May 2008	NSA
Student 24	May 2007	University of Nebraska Omaha
Student 25	May 2010	Summer 2009 Internship: NSA
Student 26	May 2009	NSA
Student 27	May 2010	Internship US Agency for International Development
Student 28	May 2010	Summer 2009 Internship: NSA, CJO: NSA
Student 29	May 2010	Summer 2009: NSA, CJO: NSA
Student 30	May 2012	Interviewed with DISA and NSA; Pending
Student 31	May 2012	Interviewed with DISA, NSA, FBI; Pending

A local security firm partnered with Student 12 and Student 16 to help with an assessment of a system used to discover Medicare Fraud. They agreed to the students' involvement because they felt our Information Assurance students were most trustworthy and they liked the idea of students learning about the cost of complying with government regulations prior to starting their careers.

Student 14 is the Branch Chief for the Computer Network Defense branch at US-STRATCOM, the youngest person ever selected for this position. He is now a hiring manager, requesting more UNO students. He has continued to stay involved with UNO via mentoring internship students.

By the end of his sophomore year, Student 17 earned his "Associate of $(ISC)^{2}$" credential and had a TS/SCI clearance in connection with a federal internship. His current federal service allows him to remain connected to our IA program and students. He was a guest observer at the most recent capture the flag competition.

Before Student 21 had even completed his first year of employment with US-STRATCOM, he was selected as the employee of the year for his branch and nominated for the overall US-STRATCOM employee of the year.
Student 24 is performing his federal service at UNO/NUCIA and working towards his graduate degree. He is the Technical Lead and the UNO Project Lead for the recurring International Cyber Defense Workshop (ICDW) for the Office of the Assistant Secretary of Defense.

Student 28 and Student 29 were both selected for the special Development Programs at NSA which select only 5-10 individuals for this program each year. This three year program will rotate our students through six six-month postings to broaden their expertise very quickly.

The College has seen a tremendous growth of job opportunities in the IT and IA areas – every student that wants an internship in the IA field is placed.

4c. Number of Students Expected to Enroll in the Program in Each of the First Five Years of Operation and Basis for the Estimate

The total graduate student population in all graduate degree programs in the College of IS&T was 222 as of Spring 2010. Of those, approximately 15%, are pursuing an IASC concentration in either the Computer Science or Management of Information Systems graduate programs currently offered by the College. Additionally, there are approximately 45 students enrolled in the undergraduate IASC degree program. This demonstrates a consistent demand for IA curriculum in the existing student population at the both the undergraduate and graduate levels. The demand for talented IA workers gives us confidence the numbers will multiply if we add the Master of Science in Information Assurance program and the ability to integrate a five-year undergraduate and graduate degree.

Additional student demand is demonstrated through the undergraduate student population of which about 20-25% has expressed a great desire for joining a Masters in IA degree program if one were available.

Another measure of demand can be anticipated from UNO graduation rates. The percentage of first-time full-time bachelor's degree-seeking students earning a bachelor's degree within six years is a good measure of how well students within states are persisting towards a degree. Nebraska is ranked 12th in graduation rates across the states (2007). A high number of these graduates can be expected to seek further education; a Master of Science in Information Assurance would fit the needs of a number of those graduates. UNO has high student retention rates of 74% from the Freshmen to Sophomore years, again pointing to a student population geared for completing their degrees and seeking further education.

Widespread demand for IA education is sensed by educational centers across the US as evidenced by the over ten-fold growth in the number of NSA Designated Centers of Academic Excellence in Information Assurance since the designation's initiation in 1999:

1999 – 7 centers (6 states)
2008 – 93 centers (37 states)
2009 – 106 centers (49 states)

These centers are not numerous enough to supply the needs for IA professionals in the workforce with an adequate number of graduate degrees in Information Assurance. A MS in IASC program would allow UNO to help fulfill the demand for IA professionals in the metropolitan area. Once-a-week evening graduate courses could be offered and have the potential to attract a large contingent from the full time IT workforce in the Omaha area.

4d. Minimum number of students required to make the program viable

A minimum of five students within the Information Assurance master's degree program will be sufficient to initiate the degree program. Over time we anticipate an additional five students per year increase and based on the time necessary to complete the degree, between 20 and 25 students will be enrolled at any given time, with approximately 10 graduating per year.

5. **Partnership with Business**

In this hyper-modern age of the global community, more important is to ensure the integrity, confidentiality and non-repudiation of data and transactions. This has become an imperative for businesses and government.

The Nebraska University Center for Information Assurance has strong working relationships with various public and private entities that depend upon us to ensure the confidentiality of their information. These entities rely upon our graduates to meet this need in their enterprises. We are supporting the cyber security efforts at organizations including: National Security Agency, US-STRATCOM, Science Applications International Corporation, Northrop Grumman, Union Pacific, ConAgra, InfoGuard, CERT and Cybercrime Task Force. NUCIA is recognized locally and nationally as a competitive pipeline for employees and resources.

The IA degree will allow us to enhance this steady stream of qualified individuals and our relationships with both public and private entities.

6. **Collaborations within the University**

The Master of Science in Information Assurance program is a wholly collaborative program. The content of the core program entails coursework from faculty in the Department of Computer Science and from faculty in the Department of Information Systems and Quantitative Analysis. The proportion in the elective tracks varies depending on which degree option the student chooses.

7. **Collaborations with Higher Education Institutions and Agencies External to the University**

UNO's collaboration with other higher educational institutions includes:

- Collaborating with other NSA-designated Centers of National Centers of Academic Excellence in Information Assurance (CAEIA) Education through peer-to-peer interactions and through conferences like the annual Colloquium for Information Systems Security Education (CISSE).
- Collaborating with the National Defense University (NDU) through conferences and a Memorandum of Understanding (MOU) for NDU students who wish to complete their graduate IA work at UNO.
- Discussing common challenges and opportunities with faculty from other institutions offering graduate IA education, including: Naval Post Graduate School, Air Force Institute of Technology, and Iowa State University.
- Supporting University of Nebraska Medical Center (UNMC) with IA expertise (e.g., protecting security of electronic patient records).
- Collaborating with University of Nebraska Lincoln (UNL); Creighton University, and Bellevue University for the Intelligence Community Centers of Academic Excellence.
- UNO's collaboration with external agencies includes:
    - Working with the National Security Agency as part of our Center of Academic Excellence.
    - As requested by the Information Assurance Policy and Strategy Office of the Assistant Secretary of Defense, UNO continues to host the International Cyber Defense Workshop (ICDW), providing specialized IA education and a UNO-hosted "Capture the Flag" contest for over 200 participants from approximately 30 countries.
    - Supporting the Nebraska Homeland Security Director (Lt. Governor) and the Nebraska State Patrol with the Nebraska Infrastructure Protection Plan (e.g., contributing to the Nebraska Infrastructure Protection Conference).
- Supporting USSTRATCOM through activities such as:
    - Participation on the STRATCOM Advisory Group Cyber panel.
    - IA demonstrations and short topics delivered to STRATCOM leadership at UNO.
    - Panel moderators for the AFCEA 2009 Cyberspace Symposium.
- Collaborative research projects with Pacific Northwest National Laboratory (PNNL).
- Coordinating funded research efforts and reporting results to Air Force Office of Scientific Research (AFOSR).
- Supporting local IT and IA professional organizations, including:
    - AIM Institute (e.g., meetings, support to Infotec Conference).
    - InfraGard (e.g., UNO faculty serving on Executive Board; facilities; IA content).
    - NEbraskaCERT (e.g., UNO faculty serving on Board of Directors; facilities for Security Professional Training; content for monthly meetings and annual conferences).

8. **Centrality to Role and Mission of the Institution**

The University of Nebraska at Omaha exists to provide appropriate educational opportunities to citizens of the State and particularly the residents of the Omaha metropolitan area. The Nebraska University Center for Information Assurance was created to develop Information Assurance professionals through degree programs and other approaches. A MS in IASC degree is a natural progression in the development of Information Assurance professionals. In addition, the MS degree provides an

educational bridge to the interdisciplinary Doctorate of Philosophy in Information Technology offered by the College of IS&T, allowing students to advance to a terminal degree in the field without having to leave the state. Furthermore, a graduate degree program in Information Assurance will provide intellectual and creative resources to advance research, also a mandate in the missions of both NUCIA and the University of Nebraska at Omaha. Thus, the proposed degree is central to both the mission of the University and the mission of NUCIA.

The spirit of the following passages from the University's Strategic Planning Framework is evident throughout this proposal:

1. The University of Nebraska will provide the opportunity for Nebraskans to enjoy a better life through access to high quality, affordable undergraduate, graduate and professional education.

a. Maintain an affordable cost of education.

e. Promote adequate student preparation for and success in higher education.

2. The University of Nebraska will build and sustain undergraduate, graduate and professional programs of high quality with an emphasis on excellent teaching.

c. Pursue excellence in programs aligned with the long-term interests of the state.

i. Determine key areas of future workforce demand and strengthen or develop curricula and programs in alignment with those areas.

3. The University of Nebraska will play a critical role in building a talented, competitive workforce and knowledge-based economy in Nebraska in partnership with the state, private sector and other educational institutions.

i. Increase enrollment of out-of-state undergraduate students at UNL, UNO and UNK.

4. The University of Nebraska will pursue excellence and regional, national and international competitiveness in research and scholarly activity, as well as their application, focusing on areas of strategic importance and opportunity.

a. Increase external support for research and scholarly activity.

- *Increase federal support for instruction, research and development, and public service.*

b. Increase undergraduate and graduate student participation in research and its application.

c. Encourage interdisciplinary, intercampus and inter-institutional collaboration.

5. The University of Nebraska will serve the entire state through strategic and effective engagement and coordination with citizens, businesses, agriculture, other educational institutions, and rural and urban communities and regions.

a. Support economic growth, health and quality of life through policy initiatives consistent with university mission.

b. Connect Nebraska cities, institutions, regions and communities through university programs.

c. Support Nebraska's economic development.

9. **Consistency with the University of Nebraska Strategic Framework**

The proposed MS in IASC degree builds on the University's focus on excellence in undergraduate and graduate education by implementing a niche graduate program that addresses an important national need. This program will further highlight Nebraska as a regional, national, and international leader in Information Assurance related education and research. This is well aligned with the long-term interests of the University of Nebraska's goal to build a talented, competitive workforce while pursing excellence

through targeted programs (strategic Goals 2b and 3[4]). Additionally, the degree will afford many opportunities to local professionals to develop lifelong educational opportunities through on-line graduate coursework in IA and related certificate programs (Goal 1d). The program also aligns with Goal 5 in that the faculty, staff and students in the program are already directly engaged with the IA community in Nebraska and the world.

10. **Avoidance of Unnecessary Duplication**

10a. Similar programs offered in the state by public or private institutions:

The College of Information Science and Technology supports an undergraduate program with a major in Information Assurance. This program provides students that would or could naturally transition into a master's degree in Information Assurance. Within the College of IS&T, the Computer Science and Management Information Systems departments maintain a concentration and certificate program in Information Assurance.

Within the metropolitan Omaha area and Nebraska, Bellevue University offers a Master of Science in Security Management; however the Bellevue curricula focuses primarily on risk analysis and issues relative to homeland security, as well as legal issues related to these topics. Creighton University does not offer any similar program. University of Nebraska – Lincoln does not offer either an undergraduate or masters degree or a concentration in Information Assurance.

10b. Similar programs offered outside the state by public or private institutions:

The closest university outside of the state of Nebraska that offers a masters program with a concentration in IA is Iowa State University. The University of South Dakota does not offer any information security courses at the undergraduate or graduate level. Dakota State University offers a Master of Science in Information Assurance. This program does not have an undergraduate program in Information Assurance. Regis University in Denver, CO, has a Master of Science degree in Information Assurance. In Appendix B, descriptions of these programs are included in this proposal.

11. **Consistency with the Comprehensive Statewide Plan for Postsecondary Education: How this program would enhance relevant statewide goals for education**

The proposed degree incorporates the role and mission of UNO by providing students with a solid core field of study (IA) and the flexibility to tailor their graduate program around their interests and needs.

As Walter Scott, chairman of the Board of Policy Advisors for the Peter Kiewit Institute, and Richard Holland, major donor to the Holland Computer Center at PKI, have stated on several occasions, the successful development of Nebraska as the nation's "Silicon Prairie" requires more than vision and money, it also requires skilled computer and information security professionals and managers.

The proposed degree program is consistent with expectations of the business community, the strategic plan of the College of IS&T and The Peter Kiewit Institute, and the statewide mandate for undergraduate and graduate education in Information Science and Technology assigned by Public Postsecondary Education.

[4] http://nebraska.edu/docs/StrategicFramework.pdf

Appendix A

Course Descriptions

Information Assurance

IASC 8080 – Special Topics (Topic MUST be related to Information Assurance. Prior approval from the Graduate Program Committee (GPC) is required to use this course in the concentration.) *Prereq: instructor permission.*

IASC 8356 – Advanced Vulnerability Discovery (3) This course is designed to introduce the student to security and vulnerability issues at a more elemental level than is generally covered in other coursework within the IA degree. The class will cover security issues at the implementation and hardware stages. The students will learn assembly language and the use of a disassembler. This will allow the student to analyze various "packing" algorithms for viruses, the viruses themselves, operating systems "hooking", "fuzzing", and other machine code exploits. *Prereq: instructor permission.*

IASC 8366 – Foundations of Information Assurance (3) This course provides an overview of the study and development of secure information systems. It introduces: threats to an information system, mitigating threats; secure system design and development; and, mechanisms for building security services and risk management. *Prereq: CSCI 1840 or equivalent(s); or instructor permission.*

IASC 8386 – Computer and Network Forensics (3) Computer forensics involves the preservation, identification, extraction and documentation of computer evidence stored on a computer. This course takes a technical, legal, and practical approach to the study and practice of incident response, computer forensics, and network forensics. Topics include legal and ethical implications, duplication and data recovery, steganography, network forensics, and tools and techniques for investigating computer intrusions. *Prereq: CSCI 3550 - Communication Networks; or ISQA 3400 - Business Data Communications.*

IASC 8410 – Distributed System and Network Security (3) This course is a detailed analysis of information security in the context of distributed systems and networks. Topics include: threats developed in the distributed systems and networks; security policies and mechanisms; the integration of secure services including secure mail, web services, and wireless; and ways to mitigate threat, including firewalls and intrusion detection systems. *Prereq: IASC 8366 or equivalent(s); or instructor permission. Not open to non-degree students*

IASC 8420 – **Software Assurance** (3) Software assurance is a reasoned, auditable argument created to support the belief that the software will operate as expected. This course is an intersection of knowledge areas necessary to perform engineering activities or aspects of activities relevant for promoting software assurance. This course takes on a software development lifecycle perspective for the prevention of flaws. *Prereq: IASC 8366 or equivalent(s); or instructor permission.*

IASC 8440 – Secure Systems Engineering (3) Secure Systems Engineering focuses on the requirements, design, assessment, and certification of secure systems. The objective of the course is to equip the student with a global view of the process of designing, developing and fielding secure information systems. *Prereq: IASC 8366; or permission of instructor*

IASC 8456 – Host-Based Vulnerability Discovery (3) The class will cover security issues at an implementation and hardware level. The students will learn assembly language and the use of a reverse assembler and debugger. This will allow the student to analyze various "packing" algorithms for computer viruses, the viruses themselves, operating system "hooking", "fuzzing", and other machine code, host-based exploits. The class will be using both Windows and Linux as operating systems. Prereq: instructor permission. Cross listed with IASC 4450.

IASC 8490 – Advanced Computer Forensics (3) This second course in computer and network forensics focuses on off-line analysis of host images from Windows and Linux platforms; suspected malware binaries; and network captures to characterize and explain the nature and scope of the compromise. *Prereq: IASC 8336 or equivalent; or instructor permission.*

IASC 8510 – Information Security Governance and Compliance (3) The purpose of this course is to review the relationship between corporate governance, policy, risk management, and compliance. *Prereq: admission to graduate program.*

IASC 8520 – Business Continuity and Disaster Planning (3) The purpose of this course is to provide the student with the background and some tools and techniques needed to implement a program of Business Continuity Planning. The course will cover crisis management, specific issues in continuity planning, a focus point on communications continuity, and the problems of plan testing and maintenance. The course is intended for all students of technology, business, and government. *Prereq: admission to graduate program.*

IASC 8900 – Independent Study for Information Assurance (3) (Research must be related to Information Assurance.) Approval from the Graduate Program Committee is required to use this course in the concentration.

IASC 8950 – Capstone in Information Assurance (3) The course consists of a student executed Information Assurance design project providing an in-depth practical experience. It typically covers system conceptualization, analysis, and design. It may also involve prototyping. The project will typically not include the actual implementation of the system. This course replaces the MS in IA comprehensive exam requirement. *Prereq: ISQA 8060, IASC 8366, IASC 8410, IASC 8440, ISQA/IASC 8546, and ISQA/IASC 8570 (Core Courses).*

IASC 8990 – Thesis (Research must be related to Information Assurance. Approval from the Graduate Program Committee is required to use this course in the concentration. Only three hours of the required six hours of thesis credit may be applied to the concentration.)

Computer Science

CSCI 8430 – Trusted System Design, Analysis and Development (3) This course examines in detail: the principles of a security architecture, access control, policy and the threat of malicious code; the considerations of trusted system implementation to include hardware security mechanisms, security models, security kernels, and architectural alternatives; the related assurance measures associated with trusted systems to include documentation, formal specification and verification, and testing, and approaches that extend the trusted system, into applications and databases and into networks and distributed systems. *Prereq: IASC 8366 or equivalents, or instructor permission. Not open to non-degree students*

CSCI 8530 – Advanced Operating Systems (3) State of the art techniques for operating system structuring and implementation. Special purpose operating systems. Pragmatic aspects of operating system design, implementation, and use. Prerequisites CSCI 4500/8506.

CSCI 8566 – Number Theory and Cryptography (3) From number theory: Factorization of Integers, Congruence Arithmetic, Primitive Roots, and Quadratic Residues and Reciprocity. In the area of secure communication: Hashing Functions, Character, Block and Stream Ciphers and the Cryptanalysis. Symmetric Key Cryptosystems such as DES, and also Public-Key Cryptosystems such as RSA and EIGamal. Also Diffie-Hellman Key Exchange, Digital Signatures, Secret Sharing, and Zero-Knowledge Proofs. *Prereq: MATH 2230 or MATH 2030. Not open to non-degree students.* (Cross-listed with CSCI-4560, MATH-4560, MATH-8566.)

CSCI 8610 – Fault Tolerant Distributed Systems (3) This course is to study the theory and practice of designing computer systems in the presence of faulty components. Emphasizes the basics of how faults can affect systems and what is required to mask or compensate for their efforts. *Prereq: CSCI 4500 and CSCI 4350, or instructor permission. Not open to nondegree students.*

Information Systems

ISQA 8060 – Research Methods (3) This course covers research methods and their application to the development and evaluation of management information systems. Also covered is the relationship between organization theory and IS research. *Prereq: CIST 2500, CIST 3100, and ISQA 8040, or permission of the instructor.*

ISQA/IASC 8530 – E-Commerce Security (3) The course will integrate concepts, principles, and technologies from business, telecommunications, and computer science to identify, understand, and propose solutions to the security threats to e-commerce. *Prereq: CIST 3100 and ISQA 8310. Not open to non-degree students.*

ISQA/IASC 8546 – Computer Security Management (3) The purpose of this course is to integrate concepts and techniques from security assessment, risk mitigation, disaster planning, and auditing to identify, understand, and propose solutions to problems of computer security and security administration. *Prereq: IASC 4360/8366, IASC 8570 or permission of the instructor.* (Cross-listed with *IASC*-4540.)

ISQA/IASC 8560 – Information Warfare and Security (3) This course will study the nature of information warfare, including computer crime and information terrorism, as it relates to international, national, economic, organizational, and personal security. Information warfare policy and ethical issues will be examined.

ISQA/IASC 8570 – **Information Security Policy and Ethics** (3) The course will cover the development and need for information security policies, issues regarding privacy, and the application of computer ethics. *Not open to non-degree students.*

ISQA/IASC 8580 – **Security Risk Analysis and Management** (3) The purpose of this course is to prepare the student for managing information security at the organizational level. This course will combine concepts from strategic management, decision science and risk analysis to prepare the student to

integrate security issues into an organizational strategic planning process. *ISQA/IASC 8546, ISQA/IASC 8570 or equivalents. Not open to non-degree students.*

ISQA 8596 / ACCT 8096 – IT Audit and Control (3) This course explores organizational and managerial issues relevant to planning and conducting IT audit and control activities. The course covers the following conceptual areas: business risks and the management of business risk, IT risk as a component of business risk, the need to manage IT risks, and the basic type of controls required in a business system in order to control IT risks. Also covered are issues associated with new risks created by the use of the internet for business applications and electronic business. **Prerequisites:** A solid understanding of business foundations such as accounting and introductory auditing and exposure to the IS discipline is essential for success in this course. *Permission of Instructor is required to enroll.*

Appendix B – Budget – See Separate Spreadsheet

Appendix C—Letters of Support (Available upon request)

Appendix D– Duplication of Academic Content
Information Assurance Concentration and Certificates
In the MS in MIS Program

Concentration in Information Assurance	Certificate in Information Assurance
Core Courses – 9 hours	**Core Courses – 12 hours**
IASC/ISQA/IASC 8560 – Information Warfare and Security **IASC/ISQA/IASC 8570** – Information Security Policy and Ethics **IASC/ISQA 8546** – Computer Security Management (Students who have taken CIST 4540 may choose an elective in place of this course)	**IASC/ISQA/IASC 8570** – Information Security Policy and Ethics **IASC/ISQA/IASC 8570** – Information Warfare and Security **IASC/ISQA/IASC 8580** – Security Risk Management and Assessment **IASC/ISQA 8546** – Computer Security Management (Students who have taken CIST 4540 may choose an elective in place of this course)
Electives – 3 hours	**Electives – 3 hours**
IASC/ISQA 8510 – Information Security Governance and Compliance **IASC/ISQA 8520** – Business Continuity and Disaster Planning **IASC/ISQA/IASC 8530** – E-Commerce Security **IASC /ISQA/IASC 8580** – Security Risk Management and Assessment **IASC 8080** – Seminar in Information Assurance (Topic MUST be related to Information Assurance. Prior approval from the Graduate Program Committee is required to use this course in the concentration.)	**ISQA 8310** – Data Communications **IASC/ISQA 8510** – Information Security Governance and Compliance **IASC/ISQA 8520** – Business Continuity and Disaster Planning **IASC/ISQA/IASC 8530** – E-Commerce Security **IASC 8900** – Independent Research in IA (must be related to information assurance) **IASC 8080** – Seminar in IA (Topic MUST be related to Information Assurance. Prior approval from the Graduate Program Committee is required to use this course in the concentration.)

IASC 8990 – Thesis (Research MUST be related to Information Assurance. Approval from the Graduate Program Committee is required to use this course in the concentration. Only three hours of the required six hours of thesis credit may be applied to the concentration.)	

Information Assurance Concentration – Computer Science

The Information Assurance concentration focuses on the study, development, evaluation, and testing of security technologies to achieve secure data and information creation, storage, communication, sharing and maintenance. Students interested in Information Assurance are encouraged to declare a formal concentration by contacting the chair of the computer science graduate program committee.

Concentration Courses (choose four) - 12 Semester Hours

- IASC 8440 — Secure Systems Engineering
- IASC 8366 — Foundations of Information Assurance
- IASC 8410 — Distributed System and Network Security
- IASC 8420 — Software Assurance (Note: Misnamed in CS literature)
- CSCI 8430 — Trusted System Design, Analysis, and Development
- CSCI 8566 — Number Theory and Cryptography
- CSCI 8610 — Fault Tolerant Distributed Systems
- CSCI 8760 — Formal Methods and High Assurance Software Engineering

Elective Courses (choose one) - 3 Semester Hours

- CSCI 8150 — Advanced Computer Architecture
- CSCI 8210 — Advanced Communication Networks
- CSCI 9210 — Type Systems Behind Programming Languages
- IASC/ISQA/IASC 8560 — Information Warfare and Security
- IASC/ISQA/IASC 8570 — Information Security, Policy, and Ethics

Appendix E

References for Section Four:

1. Presidential Decision Directive 63: http://www.usdoj.gov/criminal/cybercrime/white_pr.htm
2. US Bureau of Labor Statistics Occupation Outlook Handbook, 2008: http://www.bls.gov/oco/ocos268.htm#outlook
3. Greater Omaha Chamber of Commerce: http://www.omahachamber.org/
4. Midlands Business Journal, 12/28/2008 pgs. 1,22
5. Farida Majid, Undergraduate Advisor for the College of IS&T
6. www.ccpe.state.ne.us/publicdoc/ccpe/compplan.asp - for website with Comprehensive Statewide Plan for Postsecondary Education

TABLE 1: PROJECTED EXPENSES -Proposed UNO MS in Information Assurance

	(FY 2011-12) Year 1		(FY2012-13) Year 2		(FY 2013-14) Year 3		(FY 2014-15) Year 4		(FY 2014-15) Year 5		**Total**	
Personnel	**FTE**	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	**FTE**	**Cost**
Faculty [1]	1.4	$179,154	1.4	$184,529	1.4	$190,064	1.4	$195,766	1.4	$201,639	1.4	$951,153
Professional [2]												
Graduate assistants	2	$24,438	3	$37,657	3	$37,657	3	$37,657	3	$37,657	3	$175,066
Support staff	0.25	$8,250	0.25	$8,498	0.25	$8,752	0.25	$9,015	0.25	$9,285	0.25	$43,800
Subtotal	3.65	$211,842	4.65	$230,683	4.65	$236,474	4.65	$242,438	4.65	$248,582	4.65	$1,170,019
Operating												
General Operating [3]		$2,500		$2,500		$2,500		$2,500		$2,500		$12,500
Equipment [4]												$0
New or renovated space [5]												$0
Library/Information Resources [6]												$0
Other [7]												$0
Subtotal		$2,500		$2,500		$2,500		$2,500		$2,500		$12,500
Total Expenses	3.65	$214,342	4.65	$233,183	4.65	$238,974	4.65	$244,938	4.65	$251,082	**4.65**	**$1,182,519**

[1] The proposed degree will not require additonal faculty. We currently have adequate FTEs in the School of Interdisciplinary Informatics to meet the needs of the degree at this time. We asssume a 3% raise in base salary each AY.

[2] The degree program will not require additional professional staff.

[3] The proposed operating budget is in addition to the current budget available for the home unit (School of Interdisciplinary Informatics) for the MS in IA program.

[4] The current equipment and labs are adequate for the program and are funded through grants.

[5] The current budget in the college and school are adequate for obtainng library resources.

[6] Additional Other Expenses: None

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES -
Proposed UNO MS in Information Assurance

	(FY 2011-12)	(FY2012-13)	(FY 2013-14)	(FY 204-15)	(FY 2015-16)	
	Year 1	Year 2	Year 3	Year 4	Year 5	**Total**
Reallocation of Existing Funds [1]	$211,842	$230,684	$236,473	$242,438	$248,581	$1,170,018
Required New Public Funds [2]						
1. State Funds						
2. Local Tax Funds (community colleges)						
Tuition and Fees [3]	28,233	58,724	96,611	127,034	165,121	$475,723
Other Funding [4]						
1 Grants	$50,000	$55,000	$60,500	$66,550	$73,205	$305,255
2						
3						
Total Revenue	$290,075	$344,408	$393,584	$436,022	$486,907	$1,950,996

[1] The college of IS&T will reallocate current faculty lines in the School of Interdisciplinary Informatics and funds from Information Assurance related grants/F&A to support the program.

[2] No additional public funds are required for this program.

[3] Calculated as 4 new resident students and 1 new non-resident student taking 9 credit hours/semester in FY 2011-12, multiplied by resident tuiton and fees and increased 4% each year. We anticipate increasing enrollment and adding at least 5 (4+1) additional students per year reaching a steady state of 25 in FY 2015-16. Tuition rates for FY 2011-12 are as follows: $236.50/credit hour (Resident); $622.50/credit hour (Non-Resident)

[4] Current grants will provide additional funds to support program expenses. We have included a rate of growth in grant expenditure of about 10% per year.

TO:	The Board of Regents	Addendum VIII-B-1
	Business Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Financial Statements and related Auditors' Report for the University of Nebraska	
RECOMMENDED ACTION:	Approve the acceptance of the single audit of the University of Nebraska.	
PREVIOUS ACTION:	April 29, 2011 – The Board approved the acceptance of the Single Audit of Federal Funds under the OMB Circular A-133.	
EXPLANATION:	Approval of this item will accept the following audit of the University of Nebraska for the year ended June 30, 2011: Single Audit of Federal Funds under the OMB Circular A-133 These statements have been reviewed and accepted by the Audit Committee. Members of the public and news media may obtain a copy of the report in the Offices of the University Corporation Secretary or the Vice President for Business & Finance, 3835 Holdrege Street, Lincoln, Nebraska 68583, between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday, except University holidays.	
SPONSORS:	David E. Lechner Vice President for Business and Finance James B. Milliken President	
RECOMMENDED:	Bob Phares, Chair Audit Committee	
DATE:	March 19, 2012	

Amended April 13, 2012

TO: The Board of Regents — Addendum VIII-B-2

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Revised legal description for the Exchange Agreement between the Board of Regents (UNL), the City of Lincoln (City) and the Nebraska Innovation Campus Development Corporation (NICDC) and allow the General Counsel in consultation with the President and Chair to approve the final legal description

RECOMMENDED ACTION: Approve the revised legal description for the Exchange Agreement between the Board of Regents (UNL), the City of Lincoln (City) and the Nebraska Innovation Campus Development Corporation (NICDC) and allow the General Counsel in consultation with the President and Chair to approve the final legal description

PREVIOUS ACTION: January 27, 2012 – The Board of Regents approved the Exchange Agreement between UNL, the City and the NICDC to better facilitate the development and operation of NIC and the Theresa Street Treatment Plant Site.

EXPLANATION: On January 12, 2012 the Board of Regents approved an exchange that would include a portion of Lot 104 I.T. (currently owned by the Board of Regents) for a portion of Lot 105 I.T. (currently owned by the City of Lincoln), both within Section 13, Township 10 North, Range 6 East, Lancaster County, Nebraska. However, as NIC plans to facilitate the development and operation of NIC and the Theresa Street Treatment Plant Site changed, the exchange needed to be modified to maximize developable lots. Thus, the legal description for the Board of Regents' owned land that will be exchanged needs to be revised to include a portion of Lot 71 I.T. within Section 13, Township 10 North, Range 6 East, Lancaster County, Nebraska.

The conveyance and transfer of the exchange properties shall be subject to the City's final governmental approvals and the satisfactory findings of the environmental audit requirements per Board of Regents Policy.

PROJECT COST: None

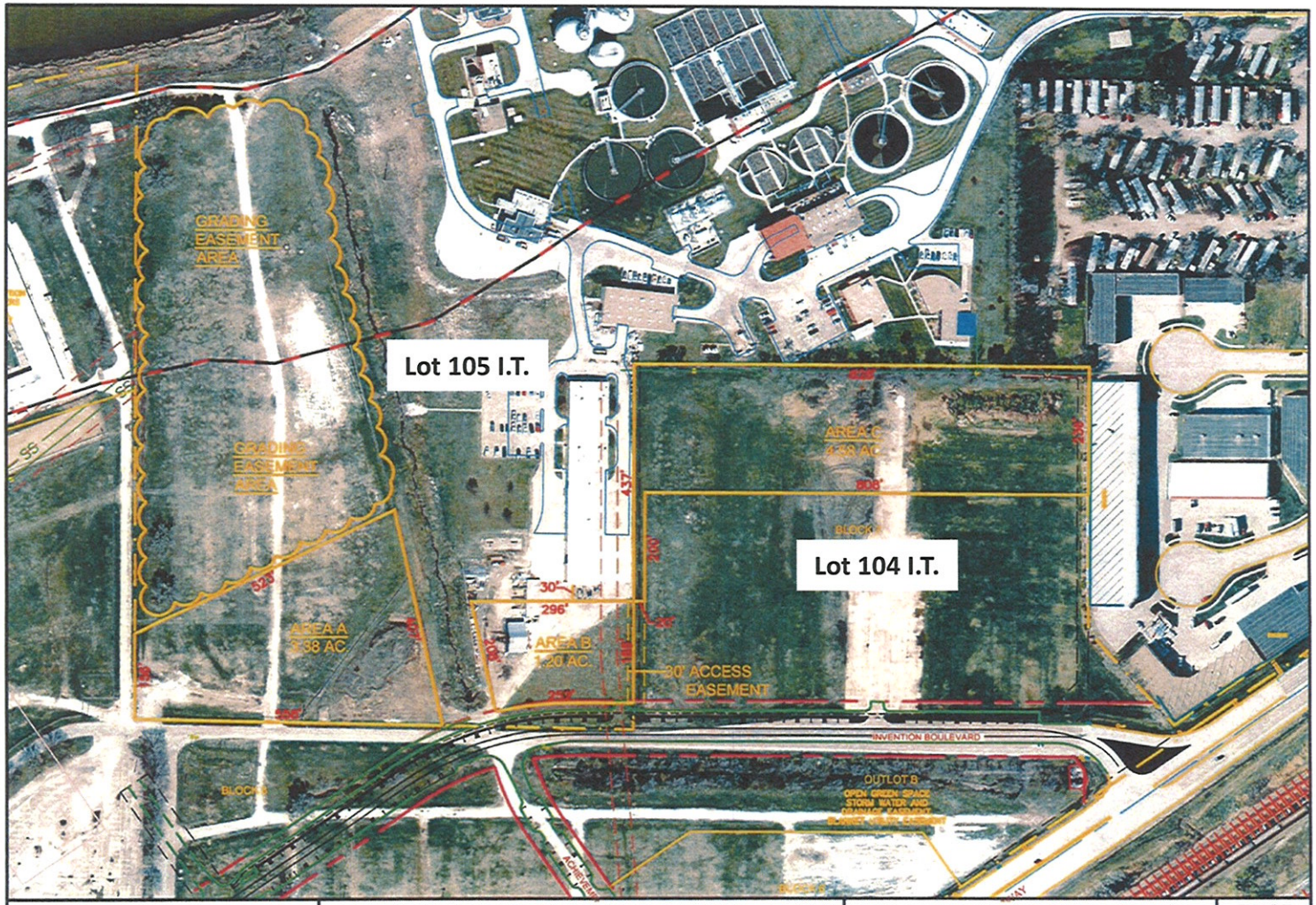
SOURCE OF FUNDS: N/A

SPONSORS: Christine A. Jackson
Vice Chancellor for Business and Finance

RECOMMENDED: Harvey Perlman, Chancellor
University of Nebraska-Lincoln

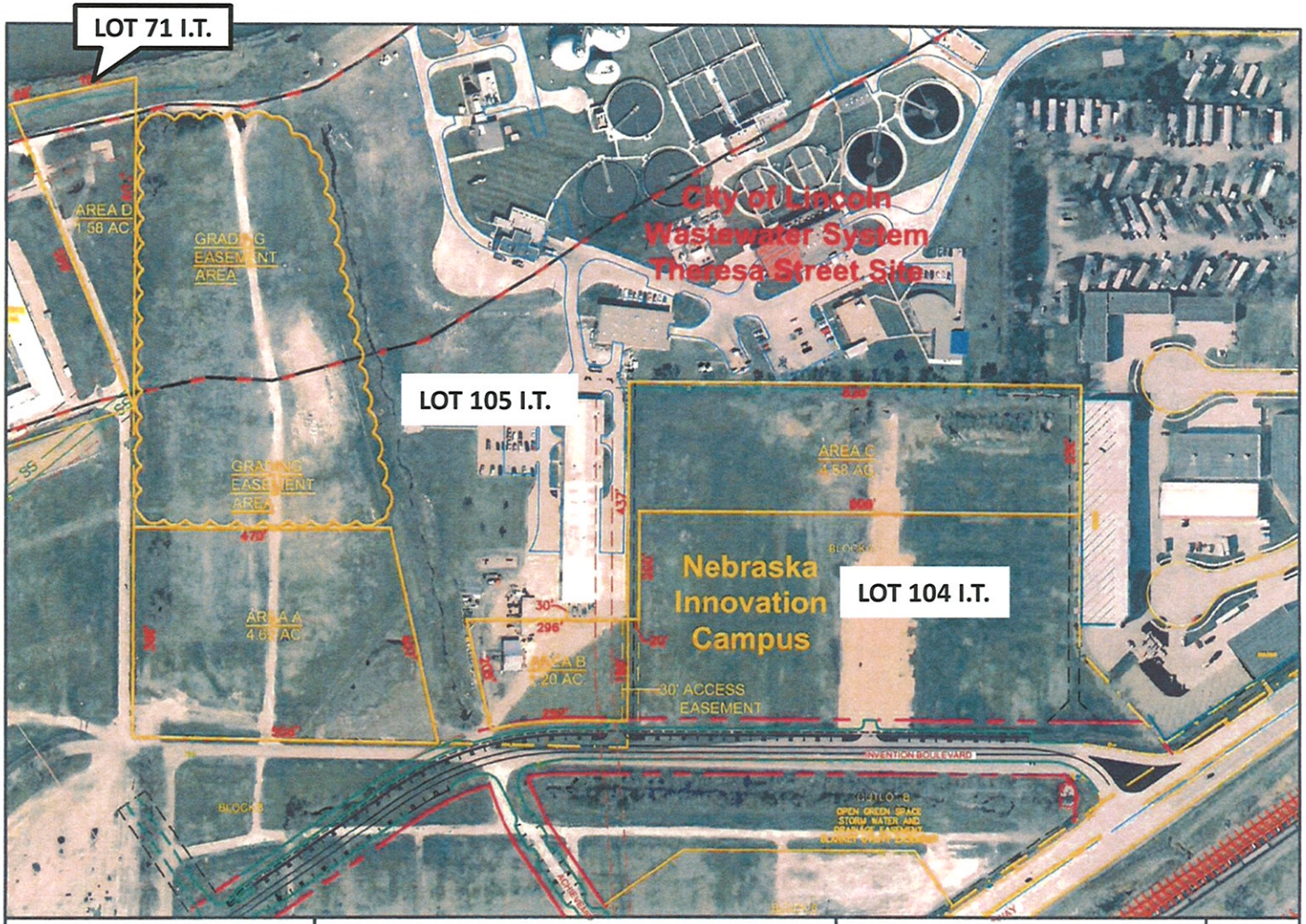
DATE: April 13, 2012

JANUARY 27, 2012



PROJECT NO: 011-0407 DRAWN BY: NKB DATE: 01.24.12	LAND EXCHANGE	OLSSON ASSOCIATES 1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	EXHIBIT A

APRIL 13, 2012



PROJECT NO: 011-0407 DRAWN BY: TCP DATE: 02.24.2012	LAND EXCHANGE	OLSSON ASSOCIATES 1111 Lincoln Mall, Suite 111 P.O. Box 84608 Lincoln, NE 68501-4608 TEL 402.474.6311 FAX 402.474.5160	EXHIBIT A

TO:	The Board of Regents	Addendum VIII-B-3
	Business Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Program Statement and Budget for Whittier Research Center Renovation – Phase II at the University of Nebraska-Lincoln	
RECOMMENDED ACTION:	Approve the Program Statement and Budget for Whittier Research Center Renovation – Phase II at the University of Nebraska-Lincoln	
PREVIOUS ACTION:	June 14, 2007 – The Board approved the program statement and budget for the renovation of the Whittier Building.	
	November 11, 2005 – The Board approved the program statement and budget for the renovation of the Whittier Building north annex for a University Child Care Center.	
EXPLANATION:	Phase II will renovate 20,900 gross square feet (GSF) of unfinished space in the Whittier Research Center for office, administrative and support space. The project will construct an interstitial floor in the former gymnasium to create a two level space for offices and support space as well as a pre-function space to support a future renovation of the auditorium. Additional office space will be available on the third floor of the building.	
	This project supports the University of Nebraska Strategic Framework goals to pursue excellence and competitiveness in research and scholarly activities. Objectives include increasing external support for research and scholarly activity, encouraging interdisciplinary and intercampus collaboration and improving the quality and quantity of research space,	
	The program statement and budget have been reviewed and approved by the Business Affairs Committee.	
	Proposed start of construction	November 2012
	Proposed completion of construction	September 2013
PROJECT COST:	$4,300,000	
ESTIMATED OPERATING AND MAINTENANCE:	Annual Operating Costs	$612,500
	1% Assessment	NA
SOURCE OF FUNDS:	Cash Funds (F & A)	
SPONSOR:	Christine A. Jackson Vice Chancellor for Business and Finance	
RECOMMENDED:	Harvey Perlman, Chancellor University of Nebraska-Lincoln	
DATE:	March 19, 2012	

University of Nebraska-Lincoln (UNL)
Whittier Research Center Renovation – Phase II
Program Statement

Campus: UNL-City Campus
Date: February 3, 2012
Prepared By: UNL Facilities Management & Planning and UNL Office of Research & Economic Development
Phone No. (402) 472-3131

1. Introduction

a. Background and History

This proposed project to finish additional space in the Whittier Research Center represents Phase II of the historic building renovation and would provide needed space for various UNL interdisciplinary research programs and UNL's Office of Research and Economic Development which would relocate from their current location in Alexander-West Building into the Whittier Research Center. With the exception of the building's auditorium, this Whittier renovation project would include finishing all remaining unfinished spaces in Whittier. The renovated space will be designed to be flexible and generic in order to facilitate changes in programs and technology.

UNL's established growth goals include both research and student enrollment. This renovation addresses both components. The Office of Admissions, currently housed in the Alexander-East Building, needs to expand staffing to accommodate the planned growth in student enrollment. Relocating Research & Economic Development staff from Alexander-West to Whittier would free up space to house additional employees in the Office of Admissions and related areas to address the growth goals in student enrollment.

Additionally, UNL's significant growth in research over the past decade and planned future growth to meet UNL's institutional goals necessitate additional space for research administration staff members who support the many UNL research faculty and programs.

Phase I, completed in 2010, fully upgraded the basic infrastructure of Whittier and fully renovated approximately 26,000 net square feet of space in the main building to provide research, laboratory, office and support space for use by various interdisciplinary research programs at UNL (tenants currently include the Nebraska Transportation Center; Nebraska Center for Research on Children, Youth, Families and Schools; Nebraska Center for Energy Sciences Research; Daugherty Water for Food Institute) and a full renovation of Whittier's North Annex for a child development center. Interior renovations included abatement of hazardous materials. Code-related modifications were made to correct life-safety and accessibility

deficiencies. Building exterior masonry was preserved to maintain the original architectural character. Finally, additional parking was provided on the south side of the building.

The Whittier Building, constructed in 1923, was the first structure designed specifically as a junior high school facility in the United States. It was last used by Lincoln Public Schools in 1977. The building was acquired by the University of Nebraska Foundation in 1983, and has been owned and operated by UNL since 1990.

Until February 2006, the main building was used as small tenant spaces for various research-related purposes, as well as the USDA screw worm research program. UNL Campus Recreation occasionally used the gymnasium for intramural activities. The north annex, a one-story, brick structure originally used by the public schools for industrial arts education, previously housed various UNL research programs. UNL solicited community input in developing the plan for renovation of this historic building prior to the recent renovation.

b. Project Description

The proposed project will fully finish space in the main building to provide offices and shared space for use by the various units within the Office of Research and Economic Development and various UNL interdisciplinary research programs. An interstitial floor in the building's former gymnasium would be added to accommodate additional space use and two unfinished spaces on the third floor will be completed. A pre-function space would be constructed on the main floor to accommodate capacity for the future renovation of the building auditorium.

The main structure of the Whittier Building contains 133,564 gross square feet (GSF). Phase I renovated 26,000 net square feet (NSF).

Phase II will renovate a total of 20,900 GSF finished space for office space. Of that area 18,920 GSF will be used by the Office of Research and Economic Development and 1,980 GSF will be renovated for pre-function space for the adjacent auditorium.

The following is a breakdown of the space.

Space at former gymnasium- 3 levels	13,970 NSF
Space on third floor	3,900 NSF
Pre-function space to serve auditorium (1st level)	1,980 NSF
TOTAL NSF	19,850 NSF
Circulation/restrooms in two-story space	1,050 SF
TOTAL SPACE RENOVATED	20,900 GSF

c. Purpose and Objectives

The purpose for renovating the Whittier Research Center is two-fold. First, the space will be used to provide much needed office and shared space for research administration units within the UNL Office of Research and Economic Development, including the Offices of Sponsored Programs, Proposal Development, Research Compliance, Research Communications and Research Information Systems. Second, additional space would be provided for various UNL interdisciplinary research programs. These uses both fit within the original goal of making the Whittier Research Center a building to support UNL's growing research mission. A pre-function space also would be included in the design to accommodate future use of the building's auditorium. All spaces will be designed to be flexible and generic in order to facilitate changes in programs and technology.

2. Justification of the Project

a. Data which supports the funding request

To continue to increase its level of competitiveness in research and scholarly activity, the University must provide sufficient and quality research administration services. Historical and planned increases in sponsored research activity at UNL require additional research administration infrastructure. UNL's research growth over the past decade – from total research awards of $63 million in FY2001 to $132.4 million in FY2011, a 110 percent increase – represents one of the fastest growth rates among U.S. research universities. In addition, increasing mandates from federal and other sponsors – related to financial, conflict of interest, and other compliance topics – require increased research administration efforts. Finally, UNL's five-year growth plan specifies planned growth in total research expenditures from $192 million in 2011 to $300 million in 2017. That growth will require additional staff and effort to support UNL's growing research enterprise. Space is available in the Whittier Research Center *now*, making this an opportune time to pursue relocating UNL's research administration offices there from the Alexander-West building. This relocation would allow the Office of Admissions and related units to locate needed staff into the Alexander-West building.

Research laboratory space is a scarce commodity at UNL, particularly as the amount of external research funding awarded to the University and the number of sponsored research projects continue to grow. Research laboratories for research programs can be one of two types – "wet labs" which often house major equipment infrastructure and have sinks, piped gases, and usually, fume hoods; and "dry labs," which are often computer-intensive with significant requirements for electrical and data wiring. This renovation project will include development of "dry labs" and office space for researchers in the Whittier building.

b. Alternatives considered

Research Facility

A research master plan, commissioned in 2006, found that "despite limited new space for research, UNL's ability to secure research funding [in the past five years] has flourished. This success has been a direct reflection of the tenacity and talent of the research faculty at UNL. They have utilized the research space made available to them to its fullest, but expenditures to support new facilities, facility renovations and expansions must now be considered a top priority for the University to continue this growth."

The Office of Research and Economic Development attempted to find available contiguous space on campus for its research administration units. Locating these offices on or near campus is desirable due to its collaborative mission and the number of faculty, staff and students who are served as clients on a daily basis. Given the shortage of available contiguous space on campus, the options for finding a suitable location for this program were extremely limited. The Antelope Valley related flood plain restrictions prevent construction of a new building near relevant campus buildings in the short term. Locating the research administration units of the Office of Research and Economic Development in the Whittier Research Center is the best option in terms of timing and proximity to related disciplines on campus.

3. Location and Site Considerations

a. County

Lancaster

b. Town or campus

University of Nebraska-Lincoln City Campus

c. Proposed site

The Whittier Research Center, formerly known as the Whittier Junior High School, is located east of 22nd Street between W and Vine streets.

Whittier Building Renovation

Project Location Map

d. Statewide building inventory

The state building inventory number for the Whittier Research Center is 51ZZ0144200B.

e. Influence of project on existing site conditions

(1) Relationship to neighbors and environment
The Whittier Research Center is located on the eastern edge of the UNL City Campus at the intersection of 22nd and Vine streets. The surrounding land use consists primarily of industrial to the north and west, including UNL's Facilities Management Shops and the former Textron building, and single family and multifamily residential to the south and east.

(2) Utilities
The site is currently served by public utilities, which are of sufficient capacity to meet project needs.

(3) Parking and circulation
Surface parking has been constructed on the open area located south of the main building for the research facility, with access provided from Vine and 22nd streets. The parking is sufficient to accommodate building tenants and extra parking is also available across the street, immediately west of 22nd Street.

4. Comprehensive Plan Compliance

a. University of Nebraska Strategic Framework

The project supports the following objectives contained in the 2010-2013 Strategic Planning Framework:

Whittier Research Center

#3: "The University of Nebraska will play a critical role in building a talented, competitive workforce and knowledge-based economy in Nebraska in partnership with the state, private sector and other educational institutions."

- *Encourage and facilitate the commercialization of research and technology to benefit Nebraska.*
- *Engage in partnerships with government and the private sector to develop regional economic strength.*
- *Develop and strengthen internship and service learning opportunities with business, education, government, military, and nonprofit organizations.*
- *Engage in partnerships with government and the private sector to develop regional economic strength.*

#4: "The University of Nebraska will pursue excellence and regional, national and international competitiveness in research and scholarly activity, as well as their application, focusing on areas of strategic importance and opportunity."

- *Increase external support for research and scholarly activity.*
- *Increase undergraduate and graduate student participation in research and its application.*
- *Encourage and support interdisciplinary, intercampus, inter-institutional and international collaboration.*
- *Improve the quality of research space through public and private support.*
- *Focus resources on areas of strength in research where the university has the opportunity for regional, national and international leadership and in areas of strategic importance to the health and economic strength of Nebraska.*

This renovation of the Whittier Research Center will develop unused space into modern office and research facilities that will make the University more competitive, thus enhancing the university's research quality and strength in attracting sponsored research funding.

b. UNL Campus Master Plan

The University of Nebraska-Lincoln Physical Master Plan 2006-2015 was approved by the Board of Regents on April 21, 2006. The Whittier Building renovation project is consistent with the land use element of the master plan for the City Campus.

The renovation of the Whittier Building will provide additional research and office space, which will bring relief to space needs identified in the Master Plan.

c. Statewide Comprehensive Capital Facilities Plan

The Statewide Facilities Plan is Chapter Six of the *Comprehensive Statewide Plan for Postsecondary Education in Nebraska*. This plan includes the following goals:

"Nebraskans will advocate a physical environment for each of the state's postsecondary institutions that support its role and mission; is well-utilized and effectively accommodates space needs; is safe, accessible, cost effective, and well maintained; and is sufficiently flexible to adapt to future changes in programs and technologies."

The proposed project will finish all unused spaces (except for the auditorium) in the Whittier Research Center. The research laboratories, offices, and support areas will be generic so they can be continually adapted to changes in programs and technologies.

5. Analysis of Existing Facilities

a. Functions/purpose of existing programs as they relate to the proposed project

The Office of Research and Economic Development administers programs within the university's research and economic development missions. The primary function is to support faculty in enhancing the quality and increasing the stature of UNL's research programs. That occurs through regular interaction with faculty and students to enhance the university's competitiveness for external funding by developing and maintaining appropriate research infrastructure, to ensure compliance with sponsor guidelines and to communicate about university research achievements.

b. Square footage of existing areas

The Office of Research and Economic Development currently uses 13, 503 NSF in the west side of the Alexander Building. The entire Alexander Building contains 35,417 GSF.

c. Utilization of existing space by facility, room, and/or function

EXISTING SPACE IN ALEXANDER WEST		
Space Description	**Room Use Code**	**Existing NSF**
Office	310	9,119
Office Service	315	2,668
Conference/training room	350	1,716
TOTAL NET SQUARE FOOTAGE		**13,503**

d. Physical deficiencies

The research administration units are significantly affected by the size of their current locations. The existing space is insufficient for them to accomplish their objectives. To realize the university's research potential, specifically its ambitious five year growth goals, location in a facility suitable for collaboration and growth is essential. This facility will be centrally located between the city and east campuses, which will allow clients to easily access research administration employees. Strategic development of the interior design will allow the research administration units to better collaborate and provide more efficient and effective client service through resource sharing and knowledge exchange.

e. Programmatic deficiencies

The Office of Admissions and related units require additional staffing to achieve the student enrollment growth goals. Their current space in the Alexander Building is not sufficient to accommodate staffing needs. By relocating the research administration staff from the Alexander Building to the Whittier Research Center,

the Admissions staff will have room to expand and accomplish its important institutional goals.

Similarly, relocating the research administration staff to the Whittier Research Center will allow the Office of Research and Economic Development to expand staffing to achieve its growth goals. The spaces within Whittier will be designed to offer the flexibility to be updated and altered as technology advances and units grow or change over time. Locating in the Whittier Research Center will also allow the research administration units and other campus research units to take advantage of shared meeting, display, and technology spaces which will facilitate information sharing with campus and non-campus partners and provide a suitable forum for demonstrations and presentations to funding agencies and other external constituents.

f. Replacement cost of existing building

The Facilities Management Information Report (FMIR) of June 30, 2010 indicates that the replacement cost for the Whittier Research Center is $30,173,462.

6. Facility Requirements and the Impact of the Proposed Project

a. Functions/purpose of the proposed program

(1) Activity identification and analysis
Dedicated to supporting faculty in their pursuit of research excellence, the various units within the Office of Research and Economic Development which would relocate to the Whittier Research Center, and their missions, include:

- Office of Proposal Development – partners with faculty to develop competitive external grant proposals by improving the content, organization and visual appeal of proposals and providing extensive support for development of large-scale, multi-institutional, multi-million dollar proposals.

- Office of Research Responsibility – leads in fostering responsible conduct of university research and scholarship, in compliance with federal, state and university regulations and guidelines; coordinates the Human Subjects Protection Program, Institutional Review Board, as well as compliance related to export controls, responsible conduct of research and conflict of interest.

- Office of Sponsored Programs – supports faculty in submitting the highest quality proposals possible within sponsor guidelines (budget, deadline, programmatic requirements, etc.); delivers training programs to faculty and staff; submits proposals on behalf of the university to external sponsors; negotiates and accepts sponsored awards on behalf of the Board

of Regents; and manages sponsored projects to ensure appropriate financial compliance through closeout of project, including audit.

- Research Communications – promotes UNL's growing research and economic development mission; promotes individual and team research successes through online and printed communications; develops and maintains dynamic websites for both internal clients and external audiences; and delivers multimedia support for events, activities and other research-related programs.

- Research Information Systems – plays the lead role in software development to support the university's research and economic development infrastructure; developing and maintaining the many modules of NUgrant, UNL's online research administration system; delivers IT solutions, including server, desktop and specialty multimedia to staff and faculty clients.

These units interact extensively with each other, with UNL faculty, staff and student clients and with external sponsors and collaborators. Locating them in a shared space in the Whittier Research Center, recently renovated as a shared space for many of UNL's interdisciplinary research programs makes sense as it allows close interaction among colleagues and also good use of shared resources (e.g., conference rooms, audio-visual equipment). This project will include office space and shared spaces including collaboration space and space for training activities.

In addition to the space intended for use by the Office of Research and Economic Development, remaining areas of Whittier will be developed for use by future interdisciplinary research teams, chosen for their close alignment with university priorities. It is critical to have this space available so that the university can quickly and efficiently take advantage of external funding opportunities that require space for interdisciplinary teams.

(2) Projected occupancy/use levels

	Current		Projected (2013)	
	Headcount	**FTE**	**Headcount**	**FTE**
Proposal Development				
- Director	1	1.0	1	1.0
- Managerial/Professional	3	3.0	7	7.0
Subtotal	**4**	**4.0**	**8**	**8.0**
Research Responsibility				
- Director	1	1.0	1	1.0
- Managerial/Professional	3	3.0	4	4.0
- Office/Service	1	1.0	0	0.0
Subtotal	**5**	**5.0**	**5**	**5.0**
Sponsored Programs				
- Director	1	1.0	1	1.0
- Assoc/Asst Directors, Legal	4	4.0	4	4.0
- Managerial/Professional	18	18.0	21	22.0
- Office/Service	1	1.0	1	1.0
- Law Interns/Student Workers	4	0.7	4	0.7
Subtotal	**28**	**24.7**	**31**	**28.7**
Research Info. Systems				
- Director	1	1.0	1	1.0
- Managerial/Professional	3.5	2.5	3.5	2.5
- Office/Service	1	1.0	1	1.0
- Student Workers	1	0.1	2	0.2
Subtotal	**6.5**	**3.6**	**7.5**	**4.7**
Research Communications				
- Managerial/Professional	2.5	2.5	4.5	4.5
- Student Workers	0	0	2	0.2
Subtotal	**2.5**	**2.5**	**6.5**	**4.7**
Other Research Staff				
- Managerial/Professional	2.0	2.0	3.0	3.0
- Office/Service	0.0	0.0	1.0	1.0
Subtotal	**3.0**	**2.1**	**7.0**	**4.3**
Total	**49.0**	**41.9**	**65.0**	**55.4**

b. Space requirements

(1) Square footage by individual areas and/or functions

Program/Space Description	Room-Use Code	NSF	# of Rooms	Total NSF
Office of Research and Economic Development				
Office of Proposal Development				
Office, Director	310	140	1	140
Office, Sr. Proposal Development Specialist	310	140	1	140
Office, Proposal Development Specialist	310	140	5	700
Office, Award Coordinator	310	140	1	140
Subtotal NSF				**1,120**
Office of Research Responsibility				
Office, Director	310	140	1	140
Office, Research Compliance Specialist	310	140	4	560
Collaboration Area	350	250	1	250
Subtotal NSF				**950**
Office of Sponsored Programs				
Office, Director	310	140	1	140
Office, Assoc/Asst Managers, Legal Manager	310	140	4	560
Office, Grant Coordinator	310	140	9	1260
Office, Project Specialist (Accounting)	310	140	12	1680
Office, Clerical Support	310	120	1	120
Workstations, Student	310	100	4	400
File Storage	315	8	75	600
Subtotal NSF				**4,760**
Research Information Systems				
Office, Director	310	140	1	140
Office, Analyst/Support Coordinator	310	140	1	140
Office, Lead Programmer/Programmer	310	140	2	280
Office, IT Support	310	140	1	140
Workroom/IT Support	315	180	1	180
Subtotal NSF				**880**

Program/Space Description	Room-Use Code	NSF	# of Rooms	Total NSF
Research Communications				
Office, Communications Specialists	310	140	4	560
Office, Graphic & Web Designer	310	140	1	140
Workstations, Student	310	100	3	300
Subtotal NSF				**1,000**
Other Research Staff				
Office, Director	310	140	1	140
Office, Project Manager	310	140	2	280
Subtotal NSF				**420**
Shared Spaces				
Small collaboration rooms (2-4 persons)	350	140	6	840
Team collaboration rooms (5-8 persons)	350	280	3	840
Reception/Waiting Area	315	250	1	250
Training Rm. (25-30 persons, w/ computers, video)	350	750	1	750
Training Rm. Service	355	80	1	80
Primary Workroom/Copy	315	280	1	280
Satellite Workroom	315	150	2	300
Staff Lounge	315	650	1	650
Satellite breakrooms	315	200	2	400
Publications and IT Storage	315	450	1	450
Subtotal NSF				**4,840**
Pre-Function Space	**315**	**1,980**	**1**	**1,980**
Third Floor Unassigned areas				
West area	310			2,000
East area	310			1,900
Subtotal NSF				**3,900**
Total Net Square Footage*				**19,850**
Total Gross Square Footage				**20,900**
* Does not include over 1,000 sf in shared conference room space that will be available to the Office of Research and Economic Development in the new space.				

(2) Basis for square footage and planning parameters
The basis for the space assignments includes the NU Space Guidelines, UNL space assignment practices and the expertise of the project consultants.

(3) Square footage difference between existing and proposed areas

WHITTIER RESEARCH CENTER SPACE COMPARISON				
Space Description	***Room Use*** **Code**	***Existing*** **NSF**	***Proposed*** **NSF**	***Difference***
Office	310	9,119	12,000	2,881
Office Service	315	2,668	3,110	442
Conference/training room*	350	1,716	2,680	964
Conference room service	355	-	80	80
TOTAL NET SF		**13,503**	**17,870**	**4,287**

c. Impact of the proposed project on existing space

(1) Reutilization and function(s)
Existing spaces vacated by personnel in the Office of Research and Economic Development, and other research faculty, staff and students in University buildings, will be reassigned by the Office of Institutional Research and Planning (IRP) to other University departments and/or programs. The Office of Admissions and related units are in a growth phase and have great need for the space to be vacated by the Office of Research and Economic Development. Relocating departments representing the highest and best use for vacated spaces will be managed by IRP.

(2) Demolition
Most necessary demolition occurred during the recent Phase I renovation. Other demolition will be completed as needed to accommodate the new installations, including a new interstitial floor in the former gymnasium space. Demolition required with this project should be located within the spaces being renovated and will be coordinated to minimize impact on adjacent and occupied spaces.

(3) Renovation
Steps will be taken to minimize the impact of demolition and renovation activities in other parts of the building currently occupied by tenants.

7. Equipment Requirements

a. List of available equipment for reuse

Wherever possible, equipment currently used by the groups comprising the Office of Research and Economic Development and other research programs will be removed and reinstalled into their respective areas of the Whittier Research Center. A

detailed list of reusable equipment will be developed during the design phase of the project.

b. Additional Equipment

(1) Fixed Equipment
No fixed equipment is planned for use by the Office of Research and Economic Development.

(2) Movable Equipment
A detailed list of movable equipment will be developed during the design phase of the project.

(3) Special or Technical Equipment

No special or technical equipment is included in the budget for this project and is the responsibility of the individual programs. A detailed list of such equipment will be developed during the design phase.

8. Special Design Considerations

a. Construction Type

Interior work will be stud and frame. The floor system of the main building is concrete. All work will be designed according to UNL Design Guidelines for Facilities Construction.

b. Heating and Cooling Systems

Phase I renovation included provision for future air handling units for these areas. All new equipment will be in compliance with energy codes and UNL Design Guidelines for Facilities Construction. The HVAC system will be controlled by occupancy sensing devices which are integral with the Energy Management Control System.

c. Sustainability

Design and construction activities will be conducted with sustainability in mind including location of resources used and waste recycling and disposal.

d. Life Safety/ADA

Emergency lighting will be provided by the existing standby generator. Exit lights shall be installed as required. Required life safety equipment, such as fire alarm systems, will be connected to emergency power.

The building will be fully accessible under the terms of the ADA Accessibility Guidelines and Nebraska Accessibility Guidelines, and will conform to all applicable life-safety code requirements.

e. Security

The main entry doors to suite areas will be equipped with access control devices.

f. Historic or Architectural Significance

The Whittier Building was the first structure designed as a junior high school in the United States.

g. Artwork

Since this project will not use state funds, the 1% for Artwork provision is not applicable.

h. Phasing

This project is planned to be completed all in a single phase.

i. Future Expansion

There are no plans to expand either the main structure or the north annex in the future. Sufficient space exists to permit additional future renovation.

9. Project Budget and Fiscal Impact

a. Cost Estimate Criteria

(1) Identify recognized standards, comparison, and sources used to develop the estimated cost.
The estimated probable costs of the project were developed with the help of A/E consultants. Environmental controls, fire alarm, card access, keying, telecommunications, and signage were based on estimates developed by University staff.

(2) Identify the year and month on which the estimates are made and the inflation factors used.
The estimate was prepared in November 2011 and has been inflated by 3.5% to the mid-point of construction.

(3) Gross Square Feet	20,900 SF
Net Square Feet	19,850 SF

(4)	Total Project Cost per gross square feet	$206/GSF
	Total Project Cost per net square feet	$217/NSF
(5)	Construction Cost per gross square feet	$153/GSF
	Total Project Cost per net square feet	$162/GSF

b. Total Project Cost $4,300,000

Construction Costs $3,208,000

Non-Construction Costs $1,092,000

The detailed budget is as follows:

CONSTRUCTION COSTS		
552305	**General Construction Contractor**	**$2,172,000**
552334	**Other Construction Contractor**	**$398,000**
552311	**Sitework/Demolition**	**$0**
551200	**Land Improvements- External**	**$0**
552319	**Audio Visual Telecommunication**	**$0**
552310	**Utilities Contractor**	**$0**
552329	**Signage - Construction**	**$6,000**
552332	**Environmental Issues**	**$0**
552317	**Carpet (purchased outside of GC Contract)**	**$0**
	In-house Labor (Less Telecommunications)	**$328,000**
552382	**Telecommunications- UNL only**	**$42,000**
552314	**Fixed Equipment (purchased outside of GC Contract)**	**$0**
552326	**Construction Contingency**	**$262,000**
	Subtotal - Construction Costs	**$3,208,000**
NON-CONSTRUCTION COSTS		
552336	**Planning & Program Statement**	**$0**
552302	**A/E Basic Services**	**$305,000**
552303	**A/E Additional Services**	**$16,000**
552304	**A/E Reimbursable Expenses**	**$0**
552301	**Project Management/Construction Inspection (UNL)**	**$94,000**
526900	**Other Specialty Consultants**	**$21,000**
552315	**Movable Equipment- Capital**	**$0**
531800	**Non Capital Equipment/Supplies**	**$500,000**
552331	**Special & Technical Equipment- Capital**	**$0**
551100	**Land Acquisition**	**$0**
552321	**Artwork**	**$0**
552324	**Builder's Risk Insurance**	**$1,000**
552323	**Moving & Relocation Costs**	**$10,000**
552325	**Other Non-Construction Costs**	**$22,000**
552385	**Code Review and Inspection**	**$5,000**
552384	**Parking Replace/Lease- UNL only**	**$15,000**
552327	**Non-construction Contingency**	**$103,000**
	Subtotal - Non-construction Costs	**$1,092,000**
TOTAL PROBABLE PROJECT COSTS		**$4,300,000**

c. Fiscal Impact based upon first full year of operation

(1) Estimated additional Operational and Maintenance Costs per year
$80,000

(2) Estimated additional Programmatic costs per year
Planned staff hires over the next five years will allow the Office of Research and Economic Development to meet the institutional research growth goals. These hires represent a total of 12.3 FTE and are estimated at a total annual salary cost of $612,500.

(3) Applicable Building Renewal Assessment Charges
Not applicable

10. Funding

a.	Total Funds Required	$4,300,000
b.	Project Funding Sources	
	Cash funds	$4,300,000

c. Fiscal Year Expenditures for Project Duration

FY 2012	$ 191,000
FY 2013	$2,864,000
FY 2014	$1,245,000
Total	$4,300,000

11. Schedule

a.	Program Statement	April 13, 2012
b.	Funding	April 20, 2012
c.	Professional Consultant Selection	May 11, 2012
d.	Start Design	May 14, 2012
e.	IDR to Business Affairs Committee	July 20, 2012
f.	Complete Design	September 14, 2012
g.	Receive Bids for Construction	October 16, 2012

h.	Award of Contract and Start of Construction	November 1, 2012
i.	Completion of Construction	August 31, 2013
j.	FFE Installation	September 15, 2013
k.	Occupancy	September 30, 2013

12. Method of Contracting

a. Design – Bid – Build, awarded to the lowest responsible prime general contractor.

b. Rationale

The scope is appropriate for clear presentation in bid documents that are publicly advertised and bid. The size of the project is not well suited for other contracting methods. Bidding conditions in the Lincoln construction market are favorable and are expected to yield the best price for the project work.

13. CCPE Review is not required.

TO:	The Board of Regents	Addendum VIII-B-4
	Business Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Hamilton Hall Undergraduate Lab Renovation	
RECOMMENDED ACTION:	Approve the Renovation of Undergraduate Labs in Hamilton Hall, Second Floor North Wing	
PREVIOUS ACTION:	March 5, 2010 – The Board of Regents approved the Program Statement and Budget for the Hamilton Hall Sixth Floor Renovation.	
	January 19, 2002 – The Board approved a Change of Scope for the Hamilton Hall Infrastructure Upgrade and an increase of $3,457,000 in the project budget from $14,116,060 to $17,573,060.	
	November 3, 2000 – The Board approved the Change of Scope for the Hamilton Hall Infrastructure Upgrade and an increase of $1,991,060 in the project budget from $12,125,000 to $14,116,060.	
	July 17, 1999 – The Board approved the firm of The Clark Enersen Partners for design services for the Hamilton Hall Infrastructure Upgrade.	
	April 5, 1997 – The Board approved the Program Statement for the Hamilton Hall Infrastructure Upgrade as part of seven capital projects included in the University's major renovation/deferred maintenance initiative (LB 1100).	
EXPLANATION:	This project will renovate undergraduate laboratories and a stock room on the second floor north wing of Hamilton Hall. In addition, corridors with be renovated to provide locations for students to gather and study. This project increases the instructional efficiency of the 45-year old facility by consolidating all freshman labs and support services to one floor. These improvements support the new pedagogies in undergraduate chemistry education and will make the University more competitive in attracting and retaining students.	
	The renovation will correct fire, life safety, and accessibility deficiencies. The renovation will also include energy efficiency improvements and modifications that reflect the department's greener approach to chemistry instruction. Areas being renovated will not be occupied during construction.	
	The project has been reviewed and is recommended for approval by the Business Affairs Committee.	
	Proposed start of construction	June 2012
	Proposed completion of construction	December 2012

PROJECT COST:	$2,100,000
ON-GOING FISCAL IMPACT:	None
SOURCE OF FUNDS:	Private funds
SPONSOR:	Christine A. Jackson Vice Chancellor for Business and Finance
RECOMMENDED:	Harvey Perlman, Chancellor University of Nebraska-Lincoln
DATE:	March 19, 2012

TO:	The Board of Regents	Addendum VIII-B-5
	Business Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Purchase of Ion Beam Etching System	
RECOMMENDED ACTION:	Approve the sole source purchase of Ion Beam Etching System for the University of Nebraska-Lincoln.	
PREVIOUS ACTION:	None	
EXPLANATION:	The Nanoquest I-UHV Ion Beam Etching System is the most versatile ion beam development platform available and is unique for a number of features. It provides a simple etch to multi-angle etches with superior etch uniformity. The main chamber of the system is specially built to achieve an ultrahigh vacuum, which is very critical for oxygen sensitive materials. The special design of the system also includes six magnetron sputtering guns for magnetic material disposition and a Secondary Ion Mass Spectrometry (SIMS) probe subsystem. The SIMS probe provides the highest sensitivity of end point detection comparing to other similar systems. This is extremely important for the etching process of multilayer thin films for the particular research conducted by the Nebraska Center for Materials and Nanoscience.	
PROJECT COST:	$618,500	
SOURCE OF FUNDS:	Federal Funds	
SPONSOR:	Christine A. Jackson Vice Chancellor for Business & Finance	
RECOMMENDED:	Harvey Perlman, Chancellor University of Nebraska-Lincoln	
DATE:	March 19, 2012	

TO: The Board of Regents Addendum VIII-B-6

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Fund B University Program and Facilities Fees (UPFF)
2012-13 Allocation for the University of Nebraska-Lincoln

RECOMMENDED ACTION: Approve the Fund B University Program and Facilities Fees (UPFF)
2012-13 Allocation for the University of Nebraska-Lincoln

UPPF Fund B	Approved Allocation 2011-12	Recommended Allocation 2012-13	Increase
Facilities:			
Recreation	$916,000	$916,000	- %
Existing Debt Service	2,768,090	3,652,490	31.9
Nebraska Unions	4,144,068	4,247,147	2.5
Campus Recreation	5,522,628	5,655,477	2.4
Health Center	5,926,647	6,047,094	2.0
Transit Services	412,000	707,873	71.8
Total	$19,689,433	$21,226,081	7.8%
Cost/Student/Semester	$460.25	$497.11	$36.86

PREVIOUS ACTION: June 17, 2011 – The Board of Regents approved a resolution adopting a Supplemental Resolution authoring the issuance of not to exceed $23,500,000 aggregate principal amount of UNL Student Recreation Facilities Revenue Bonds.

April 29, 2011 – The Board of Regents approved the 2011-12 Fund B allocation.

EXPLANATION: General policies governing the administration of University Program and Facilities Fees are set forth in § 5.9 of the Board of Regents' Policies of the University of Nebraska. This recommended allocation received appropriate student and administrative reviews as directed by Board of Regents policy. The proposed allocations are based on UPFF fees to be collected in 2012-13.

The primary reasons for the increase are student recreation and transportation fees:

- On June 17, 2011, the Board of Regents approved the UNL campus facilities recreation project. This followed approval by 72% of students voting in an October 2010 campus referendum. That approval included a three year series of increases of $22 per student per semester, accumulating to $60 per semester in Fall 2013. This is the second increment in that process.

- The Transit Services fee is increasing from $9 to $15.46 per semester as the first of a two phase increase necessary to maintain the transit program at its current level of service. The fee has not been increased since 2007. A similar increase is projected for 2013-14. UNL currently contracts with the City of Lincoln's StarTran for 50% of its transit services. The additional funds will either be used to replace UNL's aging bus fleet or to purchase additional transit services from StarTran.

Without the proposed new recreation facilities and salary and corresponding benefit increases, the full-time student Fund B fee would have resulted in an increase of $5.41 per semester (1.2%).

PROJECT COST: None

SOURCE OF FUNDS: None

SPONSORS: Juan N. Franco
Vice Chancellor for Student Affairs

Christine A. Jackson
Vice Chancellor for Business & Finance

RECOMMENDED: Harvey Perlman, Chancellor
University of Nebraska-Lincoln

DATE: March 19, 2012

TO: The Board of Regents — Addendum VIII-B-7

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Fund B, University Program and Facilities Fee (UPFF): 2012-13 Allocation for the University of Nebraska at Kearney (UNK)

RECOMMENDED ACTION: Approve the Fund B, University Program and Facilities Fee (UPFF) 2012-13 Allocation for the University of Nebraska at Kearney (UNK).

UPFF Fund B Category	Approved Allocation 2011-12	Recommended Allocation 2012-13	
Health Services	$782,000	$782,000	
Student Events	598,000	598,000	
Facilities	800,000	806,000	
Union	505,000	505,000	
Wellness Center	-	568,000	
TOTAL	$2,699,000	$3,259,000	
			Increase
Cost/Student/Semester	$282	$327	$45/13%

PREVIOUS ACTION: April 29, 2011 – The Board of Regents approved the 2011-12 Fund B allocation.

EXPLANATION: General policies governing the administration of the University Program and Facilities Fees are set forth in §5.9 of *the Board of Regents' Policies of the University of Nebraska.* This recommended allocation received appropriate student and administrative reviews as directed by Board of Regents' policy. The proposed allocations are based on the UPFF fees to be collected in 2012-13.

Virtually the entirety of the fee increase relates to fees related to a proposed Wellness Center on campus. The Wellness Center was approved by student representatives as noted above. The Wellness Center fee will not be implemented in Fall 2012 unless the program statement and project budget are approved by the Business Affairs committee in May and the Board of Regents approves it at the June 8 meeting.

PROJECT COST: None

SOURCE OF FUNDS: N/A

SPONSOR: Barbara L. Johnson
Vice Chancellor for Business & Finance

RECOMMENDED: Douglas A. Kristensen, Chancellor
University of Nebraska at Kearney

DATE: March 19, 2012

TO: The Board of Regents Addendum VIII-B-8

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Fund B, University Program and Facilities Fees (UPFF): 2012-13 Allocation for the University of Nebraska Medical Center

RECOMMENDED ACTION: Approve the Fund B, University Program and Facilities Fee (UPFF) 2012-13 Allocation for the University of Nebraska Medical Center.

UPFF Fund B Category	Approved Allocation 2011-12	Recommended Allocation 2012-13	
Student Health Services	$383,440	$383,440	
Supplemental Counseling	38,400	38,400	
Campus Recreation	223,125	223,125	
TOTAL	$644,965	$644,965	
			Increase
Cost/Student/Semester:	$162.25	$162.25	None

PREVIOUS ACTION: April 29, 2011 – The Board of Regents approved the 2011-12 Fund B allocation.

EXPLANATION: The 2012-2013 recommended allocation for UPFF Fund B is the same as the 2011-2012 allocation.

General policies governing the administration of University Program and Facilities Fees are set forth in § 5.9 of the *Board of Regents' Policies of the University of Nebraska*. This recommended allocation was reviewed by appropriate student representatives and administrative personnel as directed by Board of Regents policy. The recommendation, if approved, will maintain the Fund B Campus Recreation Facility Fee at $62.50/semester and maintain the Fund B Student Health Services/Supplemental Counseling Fee at $99.75/semester.

PROJECT COST: None

SOURCE OF FUNDS: None

SPONSOR: Donald S. Leuenberger
Vice Chancellor for Business & Finance

RECOMMENDED: Harold M. Maurer, Chancellor
University of Nebraska Medical Center

DATE: March 19, 2012

TO: The Board of Regents Addendum VIII-B-9

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Fund B, University Program and Facilities Fees (UPFF): 2012-13 Allocation for the University of Nebraska at Omaha

RECOMMENDED ACTION: Approve the Fund B, University Program and Facilities Fees (UPFF) 2012-13 Allocation for the University of Nebraska at Omaha (UNO).

UPFF Fund B Category	Approved Allocation 2011-12	Recommended Allocation 2012-13
Campus Recreation	$1,152,847	$1,193,888
Student Organizations & Leadership Programs	394,598	408,646
Milo Bail Student Center	587,773	608,698
Milo Bail Student Center Bond Issue	1,013,564	1,009,451
HPER Addition & Renovation Bond Issue	3,209,625	3,458,043
Men's Athletics	668,972	692,787
Women's Athletics	523,113	541,736
Musical Groups	64,563	65,151
Health Services	688,659	718,867
Facilities	260,975	256,111
Intercampus Shuttle	1,548,582	1,603,712
TOTAL	$10,113,271	$10,557,090

Cost/Student per semester:			Increase
Total Fees (assumes 12 hours)	$355.38	$373.18	5.0 %
Components:			
• Flat Fee	147.78	165.58	12.0 %
• Per Hour	17.30	17.30	0.0 %

PREVIOUS ACTION: April 29, 2011 – The Board of Regents approved the 2011-12 Fund B allocation.

EXPLANATION: General policies governing the administration of the University Program and Facilities Fees are set forth in § 5.9 of the *Board of Regents' Policies of the University of Nebraska*. This recommended allocation received appropriate student and administrative reviews as directed by Board of Regents policy.

For a full-time student, this action represents a 5.0% increase from last year.

The current 2011-12 Fund B portion of UPFF is a flat fee of $147.78 plus $17.30 per credit hour. The 2012-13 flat fee is proposed to increase to $165.59 and the per credit hour fee is proposed to remain at $17.30. The

	Fund B increase provides for salaries, benefits and operating increases to the various groups listed above.
PROJECT COST:	None
SPONSORS:	B.J. Reed Senior Vice Chancellor for Academic & Student Affairs William E. Conley Vice Chancellor for Business & Finance
RECOMMENDED:	John E. Christensen, Chancellor University of Nebraska at Omaha
DATE:	March 19, 2012

Amended Additional Item
Addendum VIII-B-10

TO: The Board of Regents

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Athletic Marketing Agreement

RECOMMENDED ACTION: Approve a five-year agreement between the University of Nebraska at Omaha and Nelligan Sports Marketing, subject to final approval of the UNO Chancellor and the Board Chair

PREVIOUS ACTION: None

EXPLANATION: Nelligan Sports Marketing (NSM) is a sports marketing organization focusing on maximizing college and university marketing efforts to generate increased funds. Under the proposed five-year agreement, NSM will provide marketing services to UNO athletics. NSM will sell sponsorships and broadcast rights, collect the related revenue, and pay all project expenses.

Gross revenues will be allocated between the parties as follows:

	UNO	**NSM**
The first $265,000	0 %	100 %
The next $475,000	100 %	0 %
The next $325,000	50 %	50 %
The next $400,000	60 %	40 %
The next $450,000	70 %	30 %
All remaining gross revenue	75 %	25 %

Currently, UNO generates $685,000 in gross annual revenues from athletic marketing activities and a net (after expenses) of $430,000. It is estimated that the first year allocation to UNO from this agreement will be $605,000.

The proposed arrangement was agreed to in principle by the Business Affairs Committee.

The proposed agreement has been approved by the Office of the General Counsel as to form and content.

Members of the public and news media may obtain a copy of the agreement in the Office of the University Corporation Secretary, 3835 Holdrege Street, Lincoln, Nebraska 68583, between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday, except University holidays.

PROJECT COST: None.

SOURCE OF FUNDS:	N/A
SPONSORS:	Trev Alberts Athletic Director
	William E. Conley Vice Chancellor for Business & Finance
RECOMMENDED:	John E. Christensen, Chancellor University of Nebraska at Omaha
DATE:	April 13, 2012

C. FOR INFORMATION ONLY

1. University of Nebraska Strategic Planning Framework Addendum VIII-C-1

2. University of Nebraska Strategic Framework Accountability Measures Addendum VIII-C-2

3. Calendar of establishing and reporting accountability measures Addendum VIII-C-3

4. University of Nebraska Strategic Dashboard Indicators Addendum VIII-C-4

5. Board of Regents agenda items related to the University of Nebraska Strategic Framework Addendum VIII-C-5

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	University of Nebraska Strategic Framework
RECOMMENDED ACTION:	For Information Only
PREVIOUS ACTION:	None
EXPLANATION:	Attached is the current version of the Strategic Framework document.
SPONSOR:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

University of Nebraska

INVESTING IN NEBRASKA'S FUTURE

Strategic Planning Framework

2010-2013

The University of Nebraska is a four-campus, public university which was created and exists today to serve Nebraskans through quality teaching, research, and outreach and engagement. We strive to be the best public university in the country as measured by the impact we have on our people and our state, and through them, the world. To do that, we must compete effectively with other institutions around the world for talented students and faculty. The future of Nebraska is closely tied to that of its only public university, and this framework guides university-wide and campus planning to help build and sustain a Nebraska that offers its citizens educational and economic opportunity and a high quality of life.

The framework consists of six overarching goals emphasizing access and affordability, quality academic programs, workforce and economic development, research growth, engagement with the state, and accountability. Each goal has a number of related objectives, strategies and accountability measures developed for Board and university-wide monitoring over a multi-year period. Companion documents include an implementation tool with metrics and the schedule for monitoring by the Board, as well as a dashboard reflecting progress.

The university's efforts will not be limited to these priorities, as we expect to be able to measure progress in other areas given the interrelatedness of the objectives, other priorities of the Board and the President, and the ongoing strategic planning efforts of the four campuses. Campus plans are consistent with this framework and operate within its broader goals. Each campus has established a set of quality indicators that provide a means to evaluate achievement and momentum related to its principal objectives.

1. The University of Nebraska will provide the opportunity for Nebraskans to enjoy a better life through access to high quality, affordable undergraduate, graduate and professional education.

    a. The university will strive to increase affordability and ensure qualified students are not denied access based on economic circumstances.

        i. Secure state funding sufficient to support access to high quality programs.

        ii. Keep tuition increases moderate and predictable for students and families, consistent with goals of both access and quality.

        iii. Expand need-based financial aid and effectively market opportunity and major aid programs (e.g. Collegebound Nebraska, Buffett Scholars, Thompson Learning Communities).

    b. Increase the percentage of Nebraska high school graduates (the state "college-going rate") who enroll at and graduate from the university.

        i. Increase enrollment, consistent with quality imperatives, to serve Nebraska's goals for increased educational attainment.

        ii. Increase each campus's undergraduate freshman-to-sophomore retention rate each year, with a goal of exceeding the average of its peer institutions.

        iii. Increase each campus's undergraduate six-year graduation rate, with a goal of exceeding the average of its peer institutions.

    c. Increase the diversity of those who enroll at and graduate from the university, employing measures permitted by state and federal law.

        i. Engage in partnerships with other higher education institutions, K-12, and the private sector to increase diversity of students who seek a post-secondary education, employing measures permitted by state and federal law.

    d. Expand lifelong educational opportunities, including those for non-traditional and transfer students.

    e. Promote adequate student preparation for success in higher education.

        i. Engage in pilot programs with Nebraska high schools for development of high school academies in partnership with the university.

        ii. Provide timely and usable information to middle school students, parents, teachers and school administrators.

f. Promote ease of transfer to the university from other higher education institutions.

    i. *Improve programs for transfer from community colleges, state colleges and other higher education institutions.*

g. Expand distance education programs, taking advantage of university-wide marketing and efficiencies and campus role and mission, strengths and entrepreneurship.

    i. *The University will offer a variety of its academic programs by distance education through Online Worldwide in an effort to provide access to the University of Nebraska to the people of the state and beyond the boundaries of the state who are unable to enroll in programs offered only on campus.*

2. The University of Nebraska will build and sustain undergraduate, graduate and professional programs of high quality with an emphasis on excellent teaching.

    a. Recruit and retain exceptional faculty and staff, with special emphasis on building and sustaining diversity.

        i. *To help ensure competitiveness, faculty salaries and incentives (awarded on the basis of merit) and fringe benefits should exceed the average of peer institutions.*

        ii. *Develop and maintain programs to enhance work/life conditions of faculty and staff, including overall campus climate.*

        iii. *Each campus shall endeavor to meet the university's ongoing commitments to faculty diversity, employing measures permitted by state and federal law.*

        iv. *Increase support for professorships and named/distinguished chairs.*

    b. Pursue excellence through focus on targeted programs in areas of importance to Nebraska where the university can be a regional, national and/or international leader (e.g. agriculture and natural resources, life sciences, information technology and architectural engineering).

        i. *Programs of Excellence funding shall be increased when practicable and results of allocations shall be periodically reviewed for impact.*

        ii. *Resource allocation shall take advantage of distinct campus roles and missions to achieve overall university goals.*

        iii. *Campuses are encouraged to collaborate to achieve overall university goals.*

    c. Provide opportunities for global engagement of faculty through international teaching, research and outreach exchanges, fellowships and collaborations.

        i. *Increase faculty participation in Fulbright and related programs.*

3. The University of Nebraska will play a critical role in building a talented, competitive workforce and knowledge-based economy in Nebraska in partnership with the state, private sector and other educational institutions.

    a. Work to stem and reverse the out-migration of graduates and knowledge workers.

    b. Increase proportion of the most talented Nebraska high school students who attend the University of Nebraska.

        i. *Increase enrollment of Nebraska students ranked in top 25% of their high school class.*

        ii. *Increase support for merit-based scholarships.*

    c. To attract talent to the state, increase the number of nonresident students who enroll at the university.

        i. *Increase enrollment of nonresident undergraduate students at UNL, UNO and UNK.*

    d. To adequately prepare students for the global economy, significantly increase opportunities for international study and engagement.

        i. *Significantly increase the number of undergraduates studying abroad, with the goal of ultimately providing the opportunity for every undergraduate to study abroad.*

        ii. *Significantly increase the number of international undergraduates and graduates studying at the university.*

    e. Encourage and facilitate the commercialization of research and technology to benefit Nebraska.

    f. Develop and strengthen internship and service learning opportunities with business, education, government, military, and nonprofit organizations.

    g. Engage in partnerships with government and the private sector to develop regional economic strength.

    h. Pursue excellence in educational attainment aligned with the long-term interests of the state.

        i. *Analyze areas of future workforce demand, including job and self-employment opportunities in non-growth rural communities and economically disadvantaged urban areas, and strengthen or develop curricula and programs appropriate to the university in alignment with those areas.*

        ii. *Develop educational programs that prepare students for the flexibility required to respond to the uncertainty of future workforce demands.*

iii. *Develop distance education and other educational programs that permit Nebraskans to prepare for jobs and opportunities to meet future workforce demands.*

4. The University of Nebraska will pursue excellence and regional, national and international competitiveness in research and scholarly activity, as well as their application, focusing on areas of strategic importance and opportunity.

    a. Increase external support for research and scholarly activity.

        i. *Increase federal support for instruction, research and development, and public service.*

        ii. *Inventory and forecast infrastructure (physical facilities, information technology, equipment) necessary to support continued growth in research activity and secure private and public support to eliminate deficiencies.*

    b. Increase undergraduate and graduate student participation in research and its application.

    c. Encourage and support interdisciplinary, intercampus, inter-institutional and international collaboration.

    d. Improve the quantity and quality of research space through public and private support.

    e. Focus resources on areas of strength in research where the university has the opportunity for regional, national and international leadership and in areas of strategic importance to the health and economic strength of Nebraska (e.g. agriculture and life sciences; natural resources, especially water; prevention and cure of diseases such as cancer; and early childhood education).

        i. *Invest resources through the Nebraska Research Initiative, Programs of Excellence and other sources to build capacity and excellence in research.*

5. The University of Nebraska will serve the entire state through strategic and effective engagement and coordination with citizens, businesses, agriculture, other educational institutions, and rural and urban communities and regions.

    a. Support economic growth, health and quality of life through policy initiatives consistent with university mission.

    b. Recognize and reward faculty innovation and effectiveness in outreach and engagement.

c. Support Nebraska's economic development.

   i. *Partner and collaborate with government and the private sector to attract, retain, and spur business development and economic opportunity.*

   ii. *Use university research and other resources to foster more effective relationships with the private sector.*

d. Support entrepreneurship education, training and outreach.

e. Collaborate with the public and private sectors to build successful regional, multistate, international linkages.

f. Use university resources to engage Nebraskans outside cities where our major campuses are located.

   i. *Effectively use the Nebraska Rural Initiative and other university-wide and campus programs to develop excellence in supporting community development while creating quality economic opportunities throughout rural Nebraska.*

   ii. *Effectively use regional research and extension operations and statewide extension for engagement with the university.*

6. The University of Nebraska will be cost effective and accountable to the citizens of the state.

   a. Support the development of a sustainable university environment.

      i. *Build a comprehensive long-range capital facilities planning process and provide a six-year capital construction plan, updated quarterly.*

      ii. *Implement the second phase of LB 605 to repair, renovate and/or replace specific university facilities.*

      iii. *Campuses shall pursue energy efficiency.*

      iv. *Campuses shall promote through policies and scheduling effective utilization of university facilities.*

   b. Maintain a safe environment for students, faculty, staff and visitors.

      i. *Develop and regularly monitor fire safety plans and procedures.*

      ii. *Collaborate with state and local government in disaster planning.*

      iii. *Develop and test campus plans for emergencies and disasters.*

c. Allocate resources in an efficient and effective manner.

    i. *Use best practices in procurement and construction and other business engagement.*

    ii. *Leverage roles and missions of campuses to find savings and cost reductions through academic, administrative and business process efficiencies and effectiveness.*

    iii. *Develop and report on matrix of business health indicators, including university debt.*

d. Maximize and leverage non-state support.

    i. *Promote entrepreneurship and revenue-generating opportunities.*

    ii. *Collaborate with the University of Nebraska Foundation to secure private support for university priorities.*

e. Create and report performance and accountability measures.

f. Maximize potential of information technology to support the university's activities.

g. Provide accurate and transparent information to the public about college costs and student learning and success outcomes.

    i. *Participate in the Voluntary System of Accountability.*

    ii. *Participate in the National Survey of Student Engagement.*

    iii. *Monitor student achievements on licensing and professional examinations.*

    iv. *Participate and measure effectiveness of national pilot projects on learning assessment with the goal of adopting university measurements.*

h. Implement awareness and education programs to assist all students in management of personal financial matters.

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	University of Nebraska Strategic Framework Accountability Measures
RECOMMENDED ACTION:	For Information Only
PREVIOUS ACTION:	None
EXPLANATION:	Attached is the current version of the Strategic accountability measures.
SPONSOR:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

University of Nebraska

INVESTING IN NEBRASKA'S FUTURE

Strategic Planning Framework

2010-2013

Accountability Measures

1. State Funding (1-a-*i*)

Secure state funding sufficient to support access to high quality programs.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
FY 2012-13	Attain sufficient state funding and manage the cost effectiveness of the University so that tuition increases do not exceed 6%.	June 2012	Business
FY 2013-14	Attain sufficient state funding and manage the cost effectiveness of the University so that tuition increases do not exceed 6%.	June 2013	Business
FY 2014-15	Attain sufficient state funding and manage the cost effectiveness of the University so that tuition increases do not exceed 6%.	June 2014	Business

2. Tuition (1-a-*ii*)

Keep tuition increases moderate and predictable for students and families, consistent with goals of both access and quality.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
FY 2012-13	Attain sufficient state funding and manage the cost effectiveness of the University so that tuition increases do not exceed 6%.	June 2012	Business
FY 2013-14	Attain sufficient state funding and manage the cost effectiveness of the University so that tuition increases do not exceed 6%.	June 2013	Business
FY 2014-15	Attain sufficient state funding and manage the cost effectiveness of the University so that tuition increases do not exceed 6%.	June 2014	Business

3. Need-based Financial Aid (1-a-*iii*)

Expand need-based financial aid and effectively market opportunity and major aid programs (e.g. Collegebound Nebraska, Buffett Scholars, Thompson Learning Communities).

Reporting Period	Accountability Measure	Report Date	Reporting Committee
FY 2011-12	Raise at least $6 million in private funds (endowment and/or spendable).	Sept. 2012	Academic
FY 2012-13	Raise at least $6 million in private funds (endowment and/or spendable).	Sept. 2013	Academic
FY 2013-14	Raise at least $6 million in private funds (endowment and/or spendable).	Sept. 2014	Academic

4. Enrollment (1-b-*i*)

Increase enrollment, consistent with quality imperatives, to serve Nebraska's goals for increased educational attainment.

Note: On October 28, 2011, the Board of Regents referred future enrollment metrics to the Academic Affairs committee of the Board for discussion and a report/recommendation at a future date.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Fall 2012	1) Increase undergraduate enrollment by 1.5% annually. 2) Maintain a retention rate of 80% or above for undergraduate students.	Oct. 2012	Academic
Fall 2013	1) Increase undergraduate enrollment by 1.5% annually. 2) Maintain a retention rate of 80% or above for undergraduate students.	Nov. 2013	Academic
Fall 2014	1) Increase undergraduate enrollment by 1.5% annually. 2) Maintain a retention rate of 80% or above for undergraduate students.	Nov. 2014	Academic

5. Graduation Rates (1-b-*iii*)

Increase each campus's undergraduate six-year graduation rate, with a goal of exceeding the average of its peer institutions.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
2010-11 Academic Year	1) Each campus will maintain or reach the average six-year graduation rate of its peers. 2) All prospective and current undergraduate students are regularly informed and assisted in obtaining the benefit of the University's four-year graduation guarantee.	Jan. 2013	Academic
2011-12 Academic Year	1) Each campus will maintain or reach the average six-year graduation rate of its peers. 2) All prospective and current undergraduate students are regularly informed and assisted in obtaining the benefit of the University's four-year graduation guarantee.	Jan. 2014	Academic
2012-13 Academic Year	1) Each campus will maintain or reach the average six-year graduation rate of its peers. 2) All prospective and current undergraduate students are regularly informed and assisted in obtaining the benefit of the University's four-year graduation guarantee.	Jan. 2015	Academic

6. Faculty Merit Compensation (2-a-*i*)

To help ensure competitiveness, faculty salaries and incentives (awarded on the basis of merit) and fringe benefits should exceed the average of peer institutions.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
FY 2011-12	1) All salary increases should be awarded, to the extent possible, on the basis of merit. 2) Average faculty salaries on each campus shall meet or exceed the midpoint of peers. 3) Once the midpoint of peers has been met or exceeded, an exceptional merit fund shall be established to provide additional incentives related to performance.	April 2012	Business
FY 2012-13	1) All salary increases should be awarded, to the extent possible, on the basis of merit. 2) Average faculty salaries on each campus shall meet or exceed the midpoint of peers. 3) Once the midpoint of peers has been met or exceeded, an exceptional merit fund shall be established to provide additional incentives related to performance.	April 2013	Business
FY 2013-14	1) All salary increases should be awarded, to the extent possible, on the basis of merit. 2) Average faculty salaries on each campus shall meet or exceed the midpoint of peers. 3) Once the midpoint of peers has been met or exceeded, an exceptional merit fund shall be established to provide additional incentives related to performance.	April 2014	Business

7. Faculty Diversity (2-a-*iii*)

Each campus shall endeavor to meet the university's ongoing commitments to faculty diversity, employing measures permitted by state and federal law.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Fall 2011	1) Increase faculty diversity, employing measures permitted by state and federal law. 2) Report on the diversity of the faculty and the relative rate of change in faculty composition as compared to peers.	Sept. 2012	Academic
Fall 2012	1) Increase faculty diversity, employing measures permitted by state and federal law. 2) Report on the diversity of the faculty and the relative rate of change in faculty composition as compared to peers.	Sept. 2013	Academic
Fall 2013	1) Increase faculty diversity, employing measures permitted by state and federal law. 2) Report on the diversity of the faculty and the relative rate of change in faculty composition as compared to peers.	Sept. 2014	Academic

8. Nebraska Top 25% (3-b-*i*)

Increase enrollment of Nebraska students ranked in top 25% of their high school class.

Note: On October 28, 2011, the Board of Regents referred the Top 25% metric to the Academic Affairs committee of the Board for discussion and a report/recommendation at a future date.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Fall 2012	Increase enrollment of first-time freshmen ranked in the top quartile of their high school graduating class to 50.0%.	Oct. 2012	Academic
Fall 2013	Maintain enrollment of first-time freshmen ranked in the top quartile of their high school graduating class at 50.0% or greater.	Nov. 2013	Academic
Fall 2013	Maintain enrollment of first-time freshmen ranked in the top quartile of their high school graduating class at 50.0% or greater.	Nov. 2014	Academic

9. Merit-based Scholarships (3-b-*ii*)

Increase support for merit-based scholarships.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
FY 2011-12	Raise at least $6 million in private funds (endowment and/or spendable).	Sept. 2012	Academic
FY 2012-13	Raise at least $6 million in private funds (endowment and/or spendable).	Sept. 2013	Academic
FY 2013-14	Raise at least $6 million in private funds (endowment and/or spendable).	Sept. 2014	Academic

10. Nonresident Student Enrollment (3-c-*i*)

Increase enrollment of nonresident undergraduate students at UNL, UNO and UNK.

Note: On October 28, 2011, the Board of Regents referred future enrollment metrics to the Academic Affairs committee of the Board for discussion and a report/recommendation at a future date.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Fall 2012	Increase the number of new nonresident undergraduate students by 1.5% percent annually.	Oct. 2012	Academic
Fall 2013	Increase the number of new nonresident undergraduate students by 1.5% percent annually.	Nov. 2013	Academic
Fall 2014	Increase the number of new nonresident undergraduate students by 1.5% percent annually.	Nov. 2014	Academic

11. Workforce Development (3-h-*i* and 3-h-*iii*)

Analyze areas of future workforce demand, including job and self-employment opportunities in non-growth rural communities and economically disadvantaged urban areas, and strengthen or develop curricula and programs appropriate to the university in alignment with those areas. (3-h-i) Develop distance education and other educational programs that permit Nebraskans to prepare for jobs and opportunities to meet future workforce demands. (3-h-iii)

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Fall 2012	Address program alignment revisions to meet workforce needs based on Fall 2011 data.	March 2013	Academic
Fall 2013	Address program alignment revisions to meet workforce needs based on Fall 2011 data.	March 2014	Academic
Fall 2014	Address program alignment revisions to meet workforce needs based on Fall 2011 data.	March 2015	Academic

12. Research (4-a-*i*)

Increase federal support for instruction, research and development, and public service.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
FY 2011-12	Increase UNL and UNMC federal research expenditures by 20% more than the weighted total federal appropriations per year on a three-year rolling average.	March 2013	Academic
FY 2012-13	Increase UNL and UNMC federal research expenditures by 20% more than the weighted total federal appropriations per year on a three-year rolling average.	March 2014	Academic
FY 2013-14	Increase UNL and UNMC federal research expenditures by 20% more than the weighted total federal appropriations per year on a three-year rolling average.	March 2015	Academic

13. Entrepreneurship (5-d)

Support entrepreneurship education, training and outreach.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Spring 2012	1) Increase training hours invested by program participants by 5% of 65,362. 2) Increase number of clients assisted by 5% of 10,307. 3) Increase number of SBIR/STTR applications by 10% of 77. 4) Increase number of SBIR/STTR awards by 5% of 21. 5) Increase investment in NU assisted companies by 10% of $52,237,513. 6) Increase NU assisted business start-ups and transitions by 5% of 583.	April 2012	Academic
Spring 2013	Evaluate and modify annual targets as appropriate.	April 2013	Academic
Spring 2014	Evaluate and modify annual targets as appropriate.	April 2014	Academic

14. LB 605 (6-a-*ii*)

Implement the second phase of LB 605 to repair, renovate and/or replace specific university facilities.

A capstone report on LB 605 was presented to the Board of Regents in January 2011.

15. Business Process Efficiencies (6-c-*ii)*

Leverage roles and missions of campuses to find savings and cost reductions through academic, administrative and business process efficiencies and effectiveness.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
2012 Calendar Year	1) Short-Term Cash/Investments: Exceed average of similar fund types 2) Endowments: Exceed average of similar fund types 3) Debt: Maintain Aa2 rating; exceed 1.15 coverage 4) Capital: Capital Queue 5) Human Resources: Meet midpoint of peers in faculty and staff salaries	1) June 2012 2) January 2013 (no Dec. 2012 meeting) 3) January 2013 (no Dec. 2012 meeting) 4) Quarterly 5) April 2012	Business
2013 Calendar Year	1) Short-Term Cash/Investments: Exceed average of similar fund types 2) Endowments: Exceed average of similar fund types 3) Debt: Maintain Aa2 rating; exceed 1.15 coverage 4) Capital: Report on Capital Queue 5) Human Resources: Meet midpoint of peers in faculty and staff salaries	1) 2nd Quarter 2013 2) 4th Quarter 2013 3) 4th Quarter 2013 4) Quarterly 5) 2nd Quarter 2013	Business
2014 Calendar Year	1) Short-Term Cash/Investments: Exceed average of similar fund types 2) Endowments: Exceed average of similar fund types 3) Debt: Maintain Aa2 rating; exceed 1.15 coverage 4) Capital: Report on Capital Queue 5) Human Resources: Meet midpoint of peers in faculty and staff salaries	1) 2nd Quarter 2014 2) 4th Quarter 2014 3) 4th Quarter 2014 4) Quarterly 5) 2nd Quarter 2014	Business

16. Student Learning Assessment (6-g)

Provide accurate and transparent information to the public about college costs and student learning and success outcomes.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Fall 2011	1) Annual or other periodic review, as available, by the Board of performance on standardized examinations and surveys, including the National Survey of Student Engagement and professional licensure examinations. 2) Annual review by the Board of participation in pilot programs to measure student learning outcomes, such as the Collegiate Learning Assessment.	April 2012	Academic
Fall 2012	1) Annual or other periodic review, as available, by the Board of performance on standardized examinations and surveys, including the National Survey of Student Engagement and professional licensure examinations. 2) Annual review by the Board of participation in pilot programs to measure student learning outcomes, such as the Collegiate Learning Assessment.	April 2013	Academic
Fall 2013	1) Annual or other periodic review, as available, by the Board of performance on standardized examinations and surveys, including the National Survey of Student Engagement and professional licensure examinations. 2) Annual review by the Board of participation in pilot programs to measure student learning outcomes, such as the Collegiate Learning Assessment.	April 2014	Academic

17. Global Engagement - Study Abroad (3-d-*i*)

Significantly increase the number of undergraduates studying abroad, with the goal of ultimately providing the opportunity for every undergraduate to study abroad.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Academic Year 2010-11	By 2019-20, the University shall increase the number of students who have participated in a study or work abroad program to 2,128. Using the base academic year 2009-10 when 1,064 participated in such programs outside the U.S., the University will achieve slightly more than 7% growth compounded each year to reach the goal.	June 2012	Academic
Academic Year 2011-12	Continue progress toward doubling by 2019-20 the number of students who have studied or worked abroad by achieving average annual growth of slightly more than 7%.	June 2013	Academic
Academic Year 2012-13	Continue progress toward doubling by 2019-20 the number of students who have studied or worked abroad by achieving average annual growth of slightly more than 7%.	June 2014	Academic

18. Global Engagement – International Student Enrollment (3-d-*ii)*

Significantly increase the number of international undergraduates and graduates studying at the university.

Note: On October 28, 2011, the Board of Regents referred future enrollment metrics to the Academic Affairs committee of the Board for discussion and a report/recommendation at a future date.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Academic Year 2011-12	By 2019-20, the University shall increase the number of international students enrolled to 6,036. Using the base academic year 2009-10 when 3,018 international students were enrolled, the University will achieve slightly more than 7% growth compounded each year to reach the goal.	Oct. 2012	Academic
Academic Year 2012-13	Continue progress toward doubling by 2019-20 the enrollment of international students by achieving average annual growth of slightly more than 7%.	Nov. 2013	Academic
Academic Year 2013-14	Continue progress toward doubling by 2019-20 the enrollment of international students by achieving average annual growth of slightly more than 7%.	Nov. 2014	Academic

19. Distance Education (1-g-*i*)

The University will offer a variety of its academic programs by distance education through Online Worldwide in an effort to provide access to the University of Nebraska to the people of the state and beyond the boundaries of the state who are unable to enroll in programs offered only on campus.

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Academic Year 2010-11	Online Worldwide shall increase its student credit hours from distance-only students in Nebraska and beyond the boundaries of the state each by 10% annually for the next five years, beginning with the base academic year of 2009-10 when distance-only credit hours were 52,460, or 53% of all distance education credit hours.	April 2012	Academic
Academic Year 2011-12	Increase student credit hours from distance-only students in Nebraska and beyond the boundaries of the state each by 10% annually through 2014-15.	April 2013	Academic
Academic Year 2012-13	Increase student credit hours from distance-only students in Nebraska and beyond the boundaries of the state each by 10% annually through 2014-15.	April 2014	Academic

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	University of Nebraska Calendar of establishing and reporting accountability measures
RECOMMENDED ACTION:	For Information Only
PREVIOUS ACTION:	None
EXPLANATION:	Attached is a calendar of establishing and reporting accountability measures.
SPONSOR:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

Strategic Framework Accountability Measure Reporting and Updating Calendar

Revised April 3, 2012

Board Meeting Date	Academic Affairs Committee	Business Affairs Committee
April 13, 2012	Student Learning Assessment [6-g] *(Licensure Exams)* Distance Education [1-g-i] Entrepreneurship [5-d]	Faculty Merit Compensation [2-a-i] Administrative/Business Efficiencies [6-c-ii] *(Report on Human Resources)*
May 18, 2012	UNMC campus visit with discussion of campus strategic plan and performance indicators.	
June 8, 2012	Study Abroad [3-d-i]	State Funding [1-a-i] Tuition [1-a-ii] Administrative/Business Efficiencies [6-c-ii] *(Report on Short-term Cash/Investments, Capital Queue)*
September 14, 2012	Faculty Diversity [2-a-iii] Need-based Financial Aid [1-a-iii] Merit-based Scholarships [3-b-ii]	Administrative/Business Efficiencies [6-c-ii] *(Report on Capital Queue)*
October 26, 2012	Enrollment [1-b-i] Nebraska Top 25% [3-b-i] Nonresident Student Enrollment [3-c-i] International Student Enrollment [3-d-ii]	None
November 29, 2012	None	None
January 25, 2013	Graduation Rates [1-b-iii]	Administrative/Business Efficiencies [6-c-ii] *(Report on Endowments, Debt, Capital Queue)* *(Usually in December but no Dec. 2012 mtg)*
February 2013	Campus visit with discussion of campus strategic plan and performance indicators.	
March 2013	Research [4-a-i] Workforce Development [3-h-i & iii]	Administrative/Business Efficiencies [6-c-ii] *(Report on Capital Queue)*

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	University of Nebraska Strategic Dashboard Indicators
RECOMMENDED ACTION:	For Information Only
PREVIOUS ACTION:	None
EXPLANATION:	Attached is the current version of the Strategic Framework Indicators.
SPONSOR:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

University of Nebraska Strategic Dashboard Indicators (April 13, 2012)

State Funding Change (1.a.i)
FY2011-12

	Target	Performance
⇧	Funding + cost mgmt = <6% tuition increase	-0.7%*

Tuition Change (1.a.ii)
FY2011-12

	Target	Performance
⬆	Funding + cost mgmt = <6% tuition increase	5.0%

Enrollment Change (1.b.i)
Fall 2011

	Target	Performance
⇩	1.5%	1.1%

Retention (1.b.i)
Fall 2011

	Target	Performance
⬆	80% Retention Rate	79.9%

Need-Based Aid (1.a.iii)
FY2010-11

	Target	Performance
⬆	Report on Collegebound Nebraska	Program implemented and expanded

Need-Based Aid (1.a.iii)
FY2010-11

	Target	Performance
⬆	Increase private funds by $6 million	Increased $9.14 million

Women Faculty (2.a.iii)
Fall 2010

	Target	Performance
⬆	Increase over 2009	2010=33.76% 2009=33.79%

Minority Faculty (2.a.iii)
Fall 2010

	Target	Performance
⬆	Increase over 2009	2010=16.15% 2009=15.38%

Top 25% Enrollment (3.b.i)
Fall 2011

	Target	Performance
⇧	Increase to 50%	47.9%

Nonresident Recruitment (3.c.i)
Fall 2011

	Target	Performance
⇩	Increase 1.5% over 2010	0.6%

Merit-Based Aid (3.b.ii)
FY2010-11

	Target	Performance
⬆	Increase private funds by $6 million	Increased $18.07 million

International Students (3.d.ii)
AY 2010-11

	Target	Performance
⬆	Double base of 3,018 students by 2019-20	4.7%

Six-Year Graduation Rate (1.b.iii)
AY2009-10

	Campus	Target	Performance
⇩	UNL	Maintain or show progress toward reaching the average six-year graduation rate of peers.	2010= -6.2% 2009= -6.1%
⬆	UNO		2010= +3.0% 2009= +5.0%
⬆	UNK		2010= +6.3% 2009= +8.4%
	UNMC	Not Applicable	Not Applicable

Faculty Salaries (2.a.i)
FY2010-11

	Campus	Target	Performance
⇩	UNL	Significant progress toward exceeding midpoint of peers	2011= -5.6% 2010= -4.6%
⇩	UNMC		2011= -8.3% 2010= -7.4%
	UNO		**
	UNK		**

LEGEND:

⬆ **Target Met or Exceeded**

⇧ **Progress Toward Target**

⇩ **Target Not Met**

University of Nebraska Strategic Dashboard Indicators (April 13, 2012)

Federal Research Funding Growth (4.a.i) UNL and UNMC FY2010-11			Research/Scholarly Activity Growth (4.a.i) UNO and UNK FY2010-11		
Campus	Target	Performance	Campus	Target	Performance
UNL	4.53%	14.32%	UNO	Double in 10 years/7% annual compounded growth over FY 2005-06	42.1%
UNMC	3.62%	23.46%	UNK		-19.6%

	Indicator	Target	Performance
⬆	**Four-Year Graduation Guarantee (1.b.iii) AY2008-09**	All prospective and current undergraduate students are informed about the University's four-year graduation guarantee.	All campuses have posted information about the four-year graduation guarantee on their websites and also have a link to four-year graduation guarantee information on the UNCA website.
⬆	**Faculty Salaries (2.a.i) Fall 2010**	Award all salary increases, to the extent possible, on the basis of merit.	Faculty salaries at UNL and UNMC may be based/granted entirely on merit, while faculty salaries at UNO and UNK are negotiated through the collective bargaining process and therefore the amount and method of distribution at UNO and UNK must be determined by agreement.
⬆	**Workforce Demand (3.h.i & iii) Spring, 2012**	Index and analyze faculty research that may contribute to new workforce opportunities.	Faculty and state agency research has been reviewed. The University of Nebraska continues to monitor relevant faculty and agency research to identify emerging workforce opportunities and trends in the state.
⇧	**Entrepreneurship (5.d) Spring 2010**	1) Increase training hours by 5%. 2) Increase number of clients by 5%. 3) Increase SBIR/STTR applications by 10%. 4) Increase SBIR/STTR awards by 5%. 5) Increase investment in NU-assisted companies by 10%. 6) Increase NU-assisted startups and transitions by 5%.	1) Training hours decreased by 22%. 2) Clients decreased by 5%. 3) SBIR/STTR applications increased 10%. 4) SBIR/STTR awards increased 17%. 5) Investment in NU-assisted companies decreased 7%. 6) NU-assisted start-ups and transitions increased 27%.
⬆	**Student Learning Assessment (6.f.i) Fall 2010**	1. Review performance on standardized examinations and surveys, including the National Survey of Student Engagement and professional licensure examinations. 2. Report on participation in pilot programs to measure student learning outcomes, such as the Collegiate Learning Assessment.	UNK, UNL and UNO currently participate in the National Survey of Student Engagement (NSSE). Performance on professional licensure examinations is above average for all campuses. Campuses are taking a variety of approaches to participation in pilot programs designed to measure learning outcomes, including exploring processes for assessing general studies requirements and participation in the administration of the College Assessment of Academic Proficiency (CAAP).

LEGEND: ⬆ **Target Met or Exceeded** | ⇧ **Progress Toward Target** | ⇩ **Target Not Met**

University of Nebraska Strategic Dashboard Indicators (April 13, 2012)

	Indicator	Target	Performance
	Administrative Best Practices (6.a.ii)		
⇧	**September 2011**	Short-Term Cash/Investments: Exceed average of similar fund types	The performance of the State's Operating Investment Pool (4.9%) slightly underperformed when compared to the benchmark value of 5.3%.
⬆	**December 2011**	Endowments: Exceed average of similar fund types	Fund N endowment s returned 25.2% for the year ending June 30, 20101 exceeding similar fund average of 23.5%%.
⬆	**January 2012**	Debt: Maintain Aa2 rating; exceed 1.15 coverage	Bond rating increased to Aa1 and exceeded 1.15 coverage.
⇩	**June 2010**	Human Resources: Meet midpoint of peers in faculty and staff salaries	Faculty salaries at all campuses are below the midpoint of peers for 2011.

Notes:

*** -0.7% decrease in state funding was offset by repeal of 1% building maintenance expense requirement. $6 million of budget cut reallocations required to balance budget.**

****UNO and UNK salaries are governed by collective bargaining.**

LEGEND: ⬆ **Target Met or Exceeded** | ⇧ **Progress Toward Target** | ⇩ **Target Not Met**

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Board of Regents agenda items related to the University of Nebraska Strategic Framework
RECOMMENDED ACTION:	For Information Only
PREVIOUS ACTION:	The current version of the framework appears as an information item at each Board of Regents meeting. April 2005 – The Board of Regents began development of the University of Nebraska "Strategic Framework – Accountability Measures" document.
EXPLANATION:	Attached is an explanation of the agenda items that are aligned with the strategic goals of the Board of Regents' Strategic Framework.
SPONSOR:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

Alignment of the University's Strategic Goals with Board of Regents Agenda Items
April 13, 2012

1. **The University of Nebraska will provide the opportunity for Nebraskans to enjoy a better life through access to high quality, affordable undergraduate, graduate and professional education.**
   - Strategic Framework annual report on distance education
   - Business Affairs committee discussion of university budget planning
   - Academic Affairs committee discussion of UNL differential tuition proposal for the College of Architecture
   - Approve the 2012-13 allocation of Fund B University Program and Facilities Fees for all campuses
   - Report of laboratory, student and miscellaneous fees for 2012-13 for all campuses

2. **The University of Nebraska will build and sustain undergraduate, graduate and professional programs of high quality with an emphasis on excellent teaching.**
   - Strategic Framework annual report on faculty merit compensation/human resources
   - Disaggregation of seven department-based tracks of the unified Ph.D. in Engineering at UNL into stand-alone Ph.D. programs
   - Approve the establishment of a Master of Science in Emergency Preparedness degree at UNMC
   - Approve the establishment of a Master of Science in Information Assurance degree at UNO
   - Report of expedited approval of UNL graduate certificates in Digital Humanities; Intellectual, Sensory and Developmental Disabilities; Transdisciplinary Childhood Obesity Prevention; and Financial and Housing Counseling
   - Report of the renaming of various majors and minors at UNL

3. **The University of Nebraska will play a critical role in building a talented, competitive workforce and knowledge-based economy in Nebraska in partnership with the state, private sector and other educational institutions.**
   - Strategic Framework annual report on entrepreneurship
   - Approve the establishment of a Master of Science in Emergency Preparedness degree at UNMC
   - Approve the establishment of a Master of Science in Information Assurance degree at UNO

4. **The University of Nebraska will pursue excellence and regional, national and international competitiveness in research and scholarly activity, as well as their application, focusing on areas of strategic importance and opportunity.**
   - Approve the program statement and budget for the Whittier Research Center renovation (Phase 2) at UNL
   - Approve the renovation of undergraduate labs in Hamilton Hall at UNL
   - Approve sole source purchase of an ion beam etching system for UNL

5. **The University of Nebraska will serve the entire state through strategic and effective engagement and coordination with citizens, businesses, agriculture, other educational institutions, and rural and urban communities and regions.**
   - Approve the establishment of a Master of Science in Emergency Preparedness degree at UNMC
   - Approve the establishment of a Master of Science in Information Assurance degree at UNO

6. **The University of Nebraska will be cost effective and accountable to the citizens of the state.**
    - Strategic Framework annual report on faculty merit compensation/human resources
    - Strategic Framework annual report on student learning assessment—licensure exams
    - Business Affairs committee update on the UNK Facilities Plan and a report on the UNK Master Plan 5-Year Update
    - Approve the acceptance of a single audit of the University of Nebraska
    - Various capital construction related requests or reports including:
        - Members of the University of Nebraska Project Review Board pool
        - Intermediate Design Report related to the UNL Outdoor Adventures Center
    - Various regular reports including bids and contracts

D. REPORTS

1. Laboratory, Student, and Miscellaneous Fees for 2012-2013 Addendum VIII-D-1

2. Strategic Framework report on Entrepreneurship [3-d] Addendum VIII-D-2

3. Renaming the Bachelor of Arts (BA) and Bachelor of Science (BS) majors, and BA and BS minors in International Studies to the Bachelor of Arts (BA) and Bachelor of Science (BS) majors, and BA and BS minors in Global Studies at the University of Nebraska-Lincoln Addendum VIII-D-3

4. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Digital Humanities Addendum VIII-D-4

5. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Intellectual, Sensory and Developmental Disabilities Addendum VIII-D-5

6. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Transdisciplinary Childhood Obesity Prevention Addendum VIII-D-6

7. Expedited Approval of the University of Nebraska-Lincoln Graduate Certificate in Financial and Housing Counseling in the Department of Child, Youth, and Family Studies Addendum VIII-D-7

8. Report of the Members of the University of Nebraska Project Review Board Pool Addendum VIII-D-8

9. UNL Outdoor Adventures Center Intermediate Design Report Addendum VIII-D-9

10. UNK Master Plan 5-Year Update Addendum VIII-D-10

11. Bids and Contracts Report Addendum VIII-D-11

Additional Item

12. Strategic Framework report on Licensure [6-g] Addendum VIII-D-12

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Laboratory, Student, and Miscellaneous Fees for 2012-2013
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	April 30, 1994 – The Board of Regents directed the four campus Chancellors to request all planned fee changes to the President for student fees to be assessed during the following academic year.
EXPLANATION:	The changes approved by the President for the University of Nebraska for the 2012-2013 academic year are listed on the attached reports by campus. This report includes courses or activities where there are changes planned in course and laboratory fees, parking permit fees, charges for student admission to athletic events, admission application fees, registration fees, and any similar such fees or charges. The report includes information on all categories of fees requested by the Board and all changes to fees that would affect the campus student body. On several campuses, a screening committee, often with student representatives, has reviewed proposed changes. Each item on the report has been reviewed and approved by campus administration.
PROJECT COST:	None
SOURCE OF FUNDS:	None
RECOMMENDED:	Harvey Perlman, Chancellor University of Nebraska-Lincoln Harold M. Maurer, M.D. Chancellor University of Nebraska Medical Center John Christensen, Chancellor University of Nebraska at Omaha Douglas A. Kristensen, Chancellor University of Nebraska at Kearney
APPROVED:	James B. Milliken President
DATE:	March 19, 2012

University of Nebraska at Kearney
Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013

Department	Course	Current Fee 2011-2012	Proposed Fee 2012-2013
College of Business & Technology			
Industrial Technology	SFED 462 - Supervision Construction Safety	$ -	$ 5.00
College of Education			
Physical Education	PE 211 - Lifeguarding	$ 6.00	$ 40.00
	PE 260 - First Aid; Responding to Emergencies	$ 5.00	$ 40.00
	PE 261 - Community First Aid & Safety Instructor	$ -	$ 40.00
	PE 262 - Community Cardiopulmonary Resuscitation	$ 5.00	$ 32.00
	PE 264 - Foundations of Athletic Training	$ 12.00	$ 40.00
College of Natural & Social Sciences			
Biology	BIOL 201 - Fundamental Tools in Biological Studies	$ 8.00	$ 17.80
Computer Science & Info Systems	CSIS 223 - Computer Organization [1]	$ -	$ 129.00
	CSIS 330 - Algorithms & Data Structure	$ -	$ 62.50
	CSIS 496/497 - Seminar in Comp Science/Com Info Syst	$ -	$ 62.50
Physics	PHYS 430 - Optics	$ 15.00	$ -
Psychology	PSY 310L - Learning & Conditioning Lab	$ 15.00	$ 20.00
	PSY 400L - Advanced Psychology Lab	$ -	$ 15.00
	PSY 477L - Psychology & Law Lab	$ -	$ 10.00
Miscellaneous Other Fees			
Administration	Admin Parking Permit [2]	$ 125.00	$ 145.00
	Faculty/Professional Staff Permit	$ 80.00	$ 95.00
	Staff	$ 65.00	$ 80.00
	Residential Parking	$ 70.00	$ 85.00
	Commuter Parking	$ 55.00	$ 65.00
	Perimeter	$ 50.00	$ 55.00
	Library Fee	$3.00/term	$4.00/sem

[1] This fee is 25% of the computer kit cost. The remaining 75% is paid by the department.

[2] Parking permit fees will also increase by the same amount for 2013-2014.

University of Nebraska-Lincoln
Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013

Department	Course	Current Fee 2011-2012	Proposed Fee 2012-2013
College of Agricultural Science and Natural Resources			
School of Natural Resources	GEOG 444/844	$ -	$ 15.00
School of Natural Resources	NRES 446/846	$ 40.00	$ 90.00
School of Natural Resources	NRES 445/845	$ 50.00	$ 90.00
College of Arts and Sciences			
Anthropology	ANTH 475/875	$ -	$ 20.00
College of Education & Human Sciences			
Nutrition & Health Sciences	HRTM 477/877	$ 20.00	$ -
Nutrition & Health Sciences	ATHT 490	$ 15.00	$ -
Child, Youth, & Family Studies	CYAF 170	$ 20.00	$ -
Child, Youth, & Family Studies	CYAF 493/893	$ 25.00	$ -
Child, Youth, & Family Studies	CYAF 821	$ 20.00	$ -
Child, Youth, & Family Studies	CYAF 872	$ 30.00	$ -
Child, Youth, & Family Studies	CYAF 906	$ 20.00	$ -
Child, Youth, & Family Studies	CYAF 907	$ 20.00	$ -
Child, Youth, & Family Studies	CYAF 980	$ 35.00	$ -
Child, Youth, & Family Studies	CYAF 371	$ -	$ 25.00
Educational Psychology	EDPS 859	$ 15.00	$ -
Educational Psychology	EDPS 860	$ 30.00	$ -
Teaching, Learning & Teacher Education	TEAC 842A	$ -	$ 15.00
Teaching, Learning & Teacher Education	TEAC 380	$ -	$ 10.00
College of Fine and Performing Arts			
Art & Art History	SCLP 111	$ -	$ 150.00
Art & Art History	SCLP 211	$ 110.00	$ 150.00
Art & Art History	SCLP 212	$ 110.00	$ 150.00
Art & Art History	SCLP 311	$ 110.00	$ 150.00
Art & Art History	SCLP 312	$ 110.00	$ 150.00
Art & Art History	SCLP 411	$ 110.00	$ 150.00
Art & Art History	SCLP 412	$ 110.00	$ 150.00
Art & Art History	PHOT 161	$ 30.00	$ 50.00
Art & Art History	PHOT 261	$ 30.00	$ 50.00
Art & Art History	PHOT 262	$ 30.00	$ 40.00
Art & Art History	PHOT 361	$ 30.00	$ 75.00
Art & Art History	PHOT 362	$ 100.00	$ 75.00
Art & Art History	PHOT 461	$ 100.00	$ 75.00
Art & Art History	PHOT 462	$ 30.00	$ 75.00
Art & Art History	PHOT 496	$ 70.00	$ 75.00
Art & Art History	PHOT 498	$ -	$ 40.00

University of Nebraska-Lincoln
Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013

Department	Course	Current Fee 2011-2012	Proposed Fee 2012-2013
College of Fine and Performing Arts (continued)			
Art & Art History	PHOT 861	$ 30.00	$ 150.00
Art & Art History	PHOT 862	$ 30.00	$ 150.00
Art & Art History	PHOT 961	$ 30.00	$ 150.00
Art & Art History	PHOT 962	$ 30.00	$ 150.00
Art & Art History	PHOT 896	$ -	$ 150.00
Art & Art History	PHOT 898	$ -	$ 50.00
Art & Art History	PHOT 899	$ -	$ 150.00
Art & Art History	PHOT 996	$ -	$ 150.00
Theatre & Film	THEA 438/838	$ -	$ 120.00
Theatre & Film	THEA 473	$ -	$ 200.00
Theatre & Film	THEA 474	$ -	$ 200.00
Miscellaneous Fees			
Libraries	Library Fee (per credit hour)	$ 3.00	$ 4.00
Business and Finance	Student Non-reserved Parking (annual cost)	$ 504.00	$ 528.00
Business and Finance	Student Reserved Parking (annual cost)	$ 936.00	$ 960.00
Business and Finance	Student Garage Parking (annual cost)	$ 612.00	$ 636.00
Business and Finance	Student Perimeter Parking (annual cost)	$ 312.00	$ 312.00

Nebraska College of Technical Agriculture
Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013

Department		Current Fee 2011-2012	Proposed Fee 2012-2013
Academic Fees			
Veterinary Technology	VTS 1603 Intro to Microbiology	$ -	$ 10.00
	VTS 2662 Clinical Pathology II	$ -	$ 10.00
	VTS 2672 Clinical Pathology III	$ -	$ 10.00
	VTE 1021 Basic Dog Grooming	$ -	$ 10.00
	VTE 2121 Advanced Dog Obedience	$ -	$ 10.00
	VTS 1613 Parasitology	$ 8.00	$ -
	VTS 1623 Hematology	$ 8.00	$ -

University of Nebraska Medical Center
Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013

Fee Type	Course	Current Fee 2011-2012	Proposed Fee 2012-2013	
	College of Dentistry			
Course Fees	Dental Student Books & Instruments D1, D2, and D3 Students (per semester)	$ 3,767.00	$ 3,842.00	(1)
	Dental Student Books & Instruments D4 Students (per semester)*	$ 3,652.00	$ 3,992.00	(1)*
	Dental Hygiene Student Books & Instruments DH3 Students (per semester)	$ 1,824.00	$ 1,860.00	(1)
	Dental Hygiene Student Books & Instruments DH4 Students (per semester)	$ 1,824.00	$ 1,910.00	(1)
	College of Medicine			
Course Fees	Biochemistry & Molecular Biology (Spring Semester)			
	BIOC 514 Biochemistry	$ 38.00	$ 46.00	(2)
Course Fees	Pharmacology and Experimental Neuroscience (per semester)			
	PHARM 680/682 (Pharmacy)	$ 35.00	$ 30.00	(3)
	College of Nursing			
Course Fees	Undergraduate Nursing Courses (per course)			
	NRSG 411, 412, 413, 414, 419, 421, 422, 423	$ -	$ 20.00	(4)
	NRSG 320 Family Centered Nursing Care of Adults	$ 25.00	$ -	(5)
	NRSG 340, 350, 450, 410, 425, 460, 480	$ 15.00	$ -	(5)
	NRSG 485, 649	$ 10.00	$ -	(5)
Course Fees	Graduate Nursing Courses (per course)			
	NRSG 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 641, 642, 643, 701, 702, 703, 704, 709, 731, 909, 910, 914, 916, 917, 918, 923, 928, 930, 931, 933, 934, 935, 936, 937	$ -	$ 20.00	(4)
	NRSG 883 Applied Pharmacology for Advanced Practice Nurses	$ 20.00	$ -	(5)
	NRSG 606 Applied Pharmacology for Advanced Practice Nurses	$ -	$ 400.00	(6)
	School of Allied Health Professions			
Course Fees	Cytotechnology (per course)			
	CYTO 702, 703, 704, 705, 706, 710, 711, 712, 714	$ 25.00	$ 175.00	(7)
Course Fees	Medical Nutrition Education (per course)			
	MNED 779 Nutrition Therapy Practicum	$ -	$ 80.00	(8)
Course Fees	Physical Therapy - PT 1's (per course)			
	PHYT 511 Integumentary Physical Therapy	$ 15.00	$ 10.00	(3)
	PHYT 522 Professional Practice Expectations I	$ 30.00	$ -	(9)
	PHYT 550 Clinical Education I	$ 20.00	$ 10.00	(3)
Course Fees	Physical Therapy - PT 2's (per course)			
	PHYT 622 Practice Management Skills in PT	$ 7.00	$ 5.00	(3)
Course Fees	Physical Therapy - PT 3's (per course)			
	PHYT 727 Imaging for Physical Therapists	$ 15.00	$ 10.00	(10)

University of Nebraska Medical Center
Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013

Fee Type	Course	Current Fee 2011-2012	Proposed Fee 2012-2013	
	School of Allied Health Professions (continued)			
Course Fees	Radiation Science Technology Education (per course)			
	RSTE 421S Professional Projects II	$ 35.00	$ 5.00	(10)
	College of Medicine			
Laboratory Fees	Genetics, Cell Biology & Anatomy (per course)			
	GCBA 452 Radiation Tech Students	$ 56.00	$ 59.00	(11)
	GCBA 552 Anatomy for Pharmacist	$ 56.00	$ 59.00	(11)
	GCBA 812 Neuroanatomy	$ 75.00	$ 96.00	(12)
	GCBA 826 Histology	$ 91.00	$ 96.00	(11)
	GCBA 830 Electron Microscopy	$ 91.00	$ 96.00	(11)
	GCBA 832 Cell & Tissue Culture	$ 91.00	$ 96.00	(11)
	GCBA 908 Advanced Hematology	$ 91.00	$ 96.00	(11)
	GCBA 910/920 Gross Anatomy (both courses)	$ 258.00	$ 271.00	(11)
	GCBA 924 Selected Problems in Electron Microscopy	$ 91.00	$ 96.00	(11)
	GCBA /Anatomy for PAs	$ 383.00	$ 618.00	(12)
	GCBA /Anatomy for PTs	$ 383.00	$ 618.00	(12)
Laboratory Fees	College of Medicine			
	M-ID 570 Structure Human Body -MO1 (1st semester)	$ 589.00	$ 618.00	(11)
	M-ID 711 Anatomic Dissection (per course)	$ 171.00	$ 300.00	(12)
	College of Nursing			
Laboratory Fees	Undergraduate Nursing Courses			
	NU 314, 334, 412, 422 (Patient Centered Care)	$ -	$ 100.00	(13)
	NU 320 Family Centered Nursing - Adults	$ 30.00	$ -	(14)
	NU 340 Family Centered Nursing - Women; NU 350 FCN - Children	$ 35.00	$ -	(14)
	NU 450 Family Centered Nursing - Acute Clients	$ 40.00	$ -	(14)
Laboratory Fees	Graduate Nursing Courses			
	NU 807 Advanced Practice Nursing in Ambulatory Care	$ 30.00	$ -	(14)
	School of Allied Health Professions			
Laboratory Fees	Physical Therapy - PT 1's (per course)			
	PHYT 522 Professional Practice Expectations I	$ -	$ 8.00	(9)
	Physical Therapy - PT 2's (per course)			
	PHYT 606 Musculoskeletal Physical Therapy III	$ 10.00	$ 12.00	(11)
	PHYT 616 Therapeutic Exercise for Special Populations	$ 12.00	$ 10.00	(10)
	PHYT 624 Orthotics & Prosthetics	$ 35.00	$ 30.00	(10)

University of Nebraska Medical Center
Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013

Fee Type	Course	Current Fee 2011-2012	Proposed Fee 2012-2013	
	Miscellaneous Fees			
Other Fees	Library Fee (per credit hour)	$ 3.00	$ 4.00	(15)
Other Fees	Distributive Learning Fee - College of Public Health (per credit hour)	$ 25.00	$ 30.00	(16)
Other Fees	COPH Technology Fee - All Students (Per Semester)	$ 100.00	$ 150.00	(16)

(1) Increase in fees to cover the increase in costs for textbooks, instruments, and other course materials
*FY 2012 Student Fees listed the Dental Student Books & Instruments D-4 Students as $3,652 per semester. The 2012 fee represented the last in a 4-year implementation to provide a credit for students toward the purchase of loupes. Since all four classes of students have paid fees including loupes (as of 2012) the appropriate prior year comparison of Dental Student Books & instrument fees for DH-4 fees is $3,767 per semester
(2) Increase in copying expense.
(3) Reduction in copying expense.
(4) Add fee for courses in revised curriculum to cover supplies and copying expenses (replacing courses in curriculum being phased out).
(5) Delete fee for courses being phased out in favor of new curriculum.
(6) Fee for acquiring new interactive CD to enhance learning -replacement course for NRSG883.
(7) Increased fee for acquiring new virtual microscopy system.
(8) New fee to cover costs of printing course materials.
(9) Deleting course fee - changing to a lab fee.
(10) Reduced supply costs.
(11) Increased cost of supplies and operating expenses.
(12) Fees extensively reviewed and adjusted to reflect actual student use for each course.
(13) Add fees for labs in revised curriculum to cover expendable supplies used in the lab (replacing labs in curriculum being phased out).
(14) Delete fees for courses being phased out in favor of new curriculum.
(15) Increase in fee to help offset inflation.
(16) Increased technology costs and increased offerings.

University of Nebraska at Omaha Laboratory, Student, and Miscellaneous Fee Changes for 2012-2013			
Department	Course	Current Fee 2011-2012	Proposed Fee 2012-2013
College of Communication, Fine Arts & Media			
Communication	SPCH 4800 Conflict Mediation	$ -	$ 45.00
College of Education			
Physical Education Activities	PEA 111W Scuba	$ 95.00	$ 110.00
Physical Education	PE 2130 Advanced Lifesaving Lifeguard Training	$ 5.00	$ 40.00
Physical Education	PE 2140 Water Safety Instructors Course	$ 5.00	$ 35.00
Health Education	HED 3030 First Aid	$ 6.00	$ 20.00
Miscellaneous Fees			
Academic & Student Affairs	Enrollment Services Fee	$52.00/sem	$55.00/sem
Academic & Student Affairs	New Student Fee	$140.50/sem	$147.50/sem
Library	Library Fee	$3.00/crhr	$4.00/crhr
Mav Card Services	ID Card Fee	$6.50/sem	$6.75/sem
Parking	Annual Permit Fee - Day	$150.00/yr	$158.00/yr
Parking	Annual Permit Fee - Evening	$75.00/yr	$79.00/yr
Parking	Garage Access Card Surcharge - East Structure	$100.00/yr	$110.00/yr

TO:	The Board of Regents Academic Affairs Committee
MEETING DATE:	April 13, 2012
SUBJECT:	Strategic Framework Report on Entrepreneurship
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	April 29, 2011 – A report on entrepreneurship was presented to the Board of Regents by the Outreach and Economic Development Ad Hoc Committee
EXPLANATION:	This report is on six accountability measures for the Strategic Framework goal 13, "Entrepreneurship, support entrepreneurship education, training and outreach." The attached report addresses the six accountability measures for this goal. The data is the latest available from the University entrepreneurship programs and covers July 1, 2010, through June 30, 2011. They measure high growth as well as life style business opportunities in Nebraska, NU's relationship to distressed companies or communities, and existing and successful operations. The first measure is number of training hours by program. These are the number of hours invested by participants in activities and seminars led by the University of Nebraska. It is an aggregate number from the members of the University of Nebraska Entrepreneurship Team (UNET). The Team's goal was to increase its activity by 5% over last year's total of 65,362 training hours. The actual count was 55,104 hours - 10,258 fewer hours - or a decline of 16%. Two factors emerged in the analysis. While several units had increases, one of the largest - Nebraska Business Development Center (NBDC) - was down about 7,000 hours because of the challenges in the economy to make the investment in training sessions offered by the University. UNL's Extension Division lost some of its data due to implementing a new software reporting system. This has since been corrected. The second measure is assistance to clients. This is an aggregate number of clients assisted with more than 30 minutes of counseling by units within UNET at the University. Clients range from current businesses, to people exploring business potential, to students of all ages and education sectors. The goal was to increase by 5% the number of clients assisted over last year's total of 10,307. Our actual count was 12,868 clients, an increase of 2,561 clients, or a 25% increase. Reversing what transpired in the previous metric, this significant increase was largely due to individuals who took the initiative to take advantage of one-on-one consulting. The third and fourth measure is of the number of Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) applications and the increase in award amounts to them. These

are federal programs meant to encourage innovation, research, and a partnership between higher education and the private sector. In 2010, there were 77 applications. The goal was to increase this by 10%. The 2011 count was 84 applications - which was an increase of seven (7) or an increase of 9%. The continued increase in applications is largely due to the investment in personnel who are generating more awareness of the program because of their presence in the field with NU faculty and partners around the state.

The goal was to increase the number of awards by 5%. This year's count was eight (8) awards, which was a decrease of 13, or a decrease of 62%. Despite the increase in applications in the previous metric, fewer awards were made with the same pool of dollars available.

The third goal included increasing the dollar amount received from the awards. The awards were $2,639,247, which was a decrease of $1,762,081, or a decrease of 40% from last year's awards of $4,401,328.

The fifth measure is the aggregate number of dollars invested, including private equity, debt financing such as commercial, Small Business Administration (SBA), United States Department of Agriculture (USDA), and other government sources outside of any SBIR or STTR grants, as well as any angel investments or venture capital. The goal was to increase last year's amount of $52,237,513 by 5%. Investment was $58,494,021, which was $6,256,508 over the previous year resulting in an increase of 12% and exceeding our goal. This increase over the previous year was primarily caused by the amount of stimulus dollars still affecting the fiscal year under analysis and the repackaging of loans during that time period.

The sixth measure is the number of new companies started or transitioned by virtue of consultation and guidance from a unit of the University. The goal was to exceed last year's number of 583 by 5%. The count was 246, which was a decrease of 337, or a decrease of 58%. Even though more dollars were invested during those transactions, there were fewer business startups.

The recommendations for next year conclude the report.

Following the report is a current listing of the members of the UNET.

PROJECT COST: None

SOURCE OF FUNDS: None

SPONSOR: Peter G. Kotsiopulos
Senior Advisor to the President for Economic Development

APPROVED: James B. Milliken, President
University of Nebraska

DATE: March 26, 2012

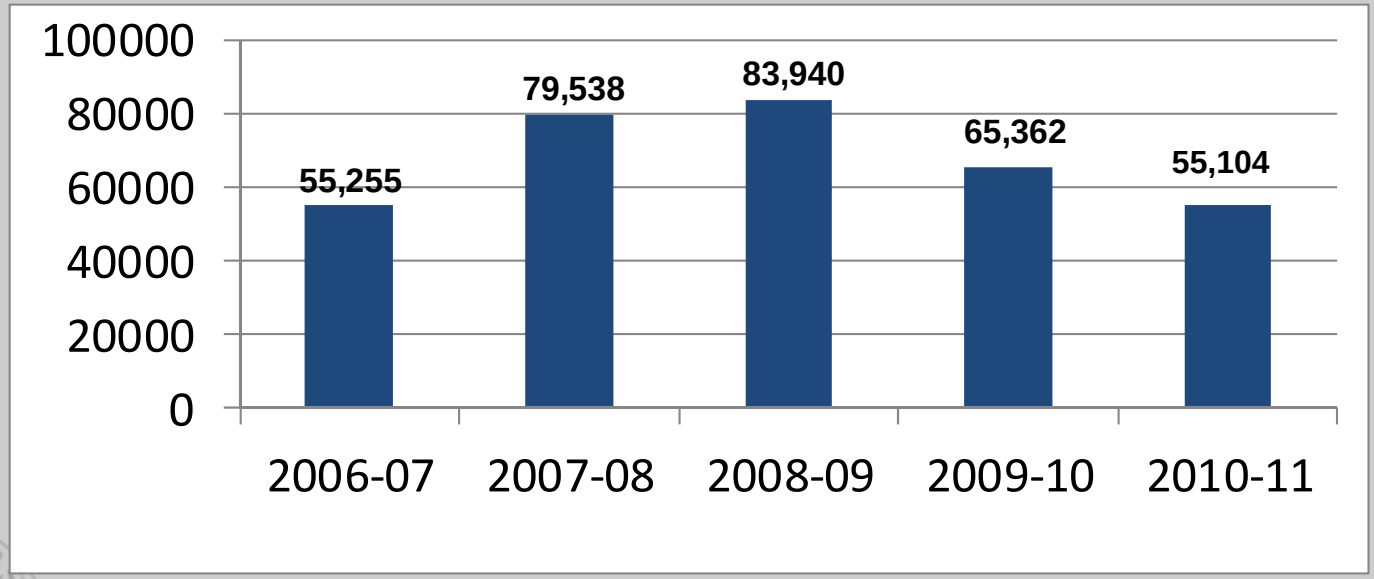
13. Entrepreneurship Accountability Measures

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Spring 2012	1) Increase training hours invested by program participants by 5% of 65,362. 2) Increase number of clients assisted by 5% of 10,307. 3) Increase the number of SBIR/STTR applications by 10% of 77. 4) Increase the number of SBIR/STTR award amounts by 5% of 21. 5) Increase investment in NU assisted companies by 5% of $52,237,513. 6) Increase NU assisted business start-ups and transitions by 5% of 583.	April 2012	Academic
Spring 2013	Evaluate and modify annual targets as appropriate	April 2013	Academic
Spring 2014	Evaluate and modify annual targets as appropriate	April 2014	Academic

Training

Increase training hours invested by University program participants by 5%

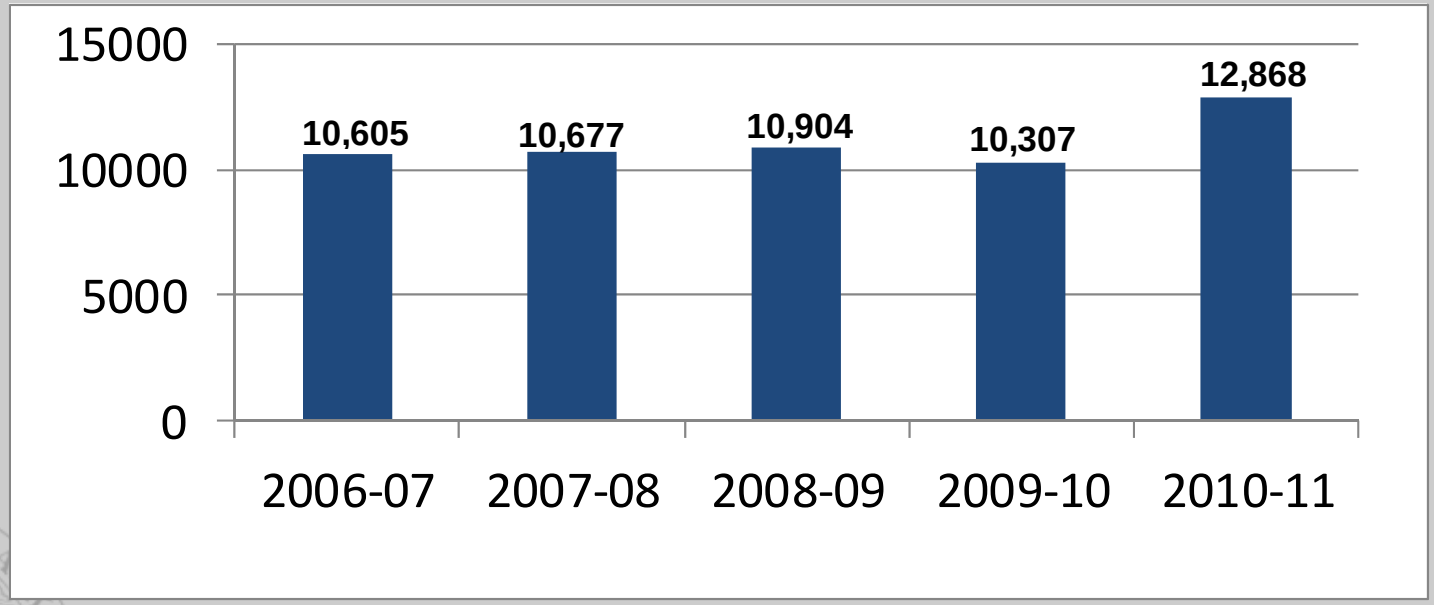
- Did not meet goal = -10,258 (-16%)



Assistance

Increase number of University clients assisted by 5%

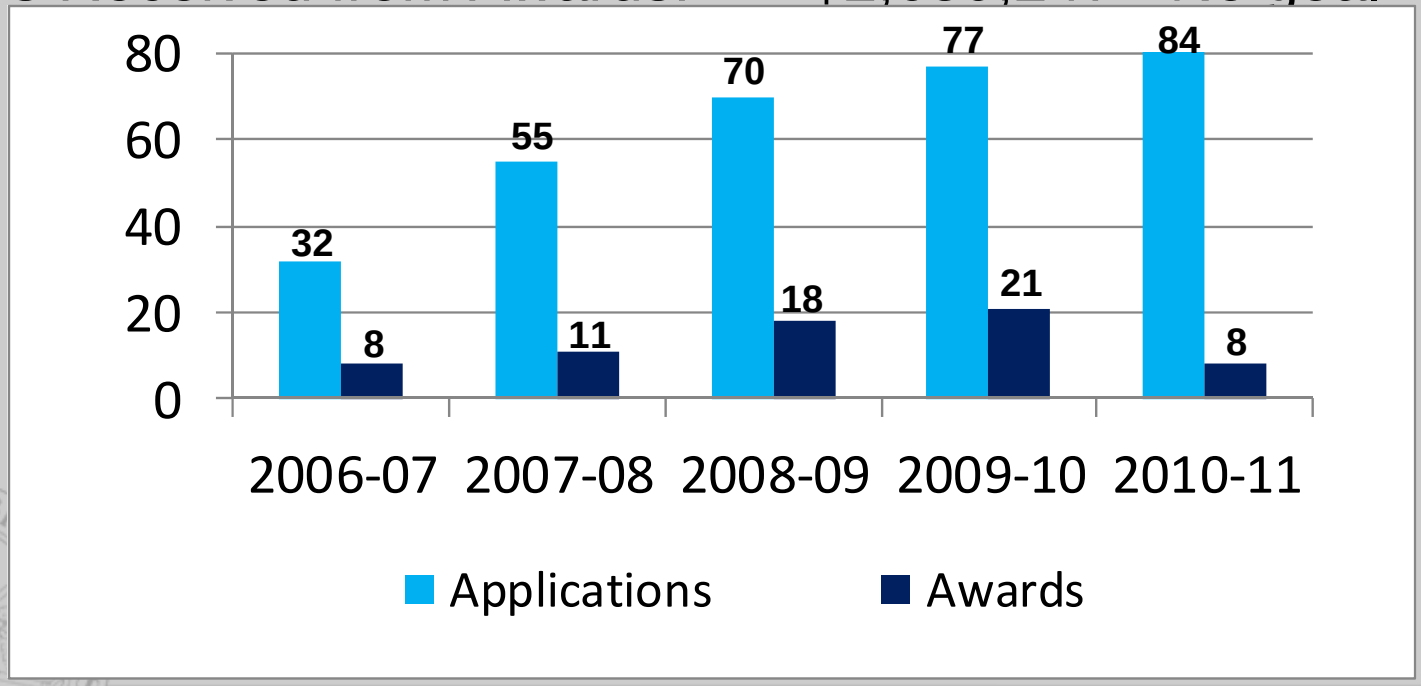
- Did meet goal = +2,561(+25%)



SBIR/STTR

Increase applications by 10% and awards by 5%

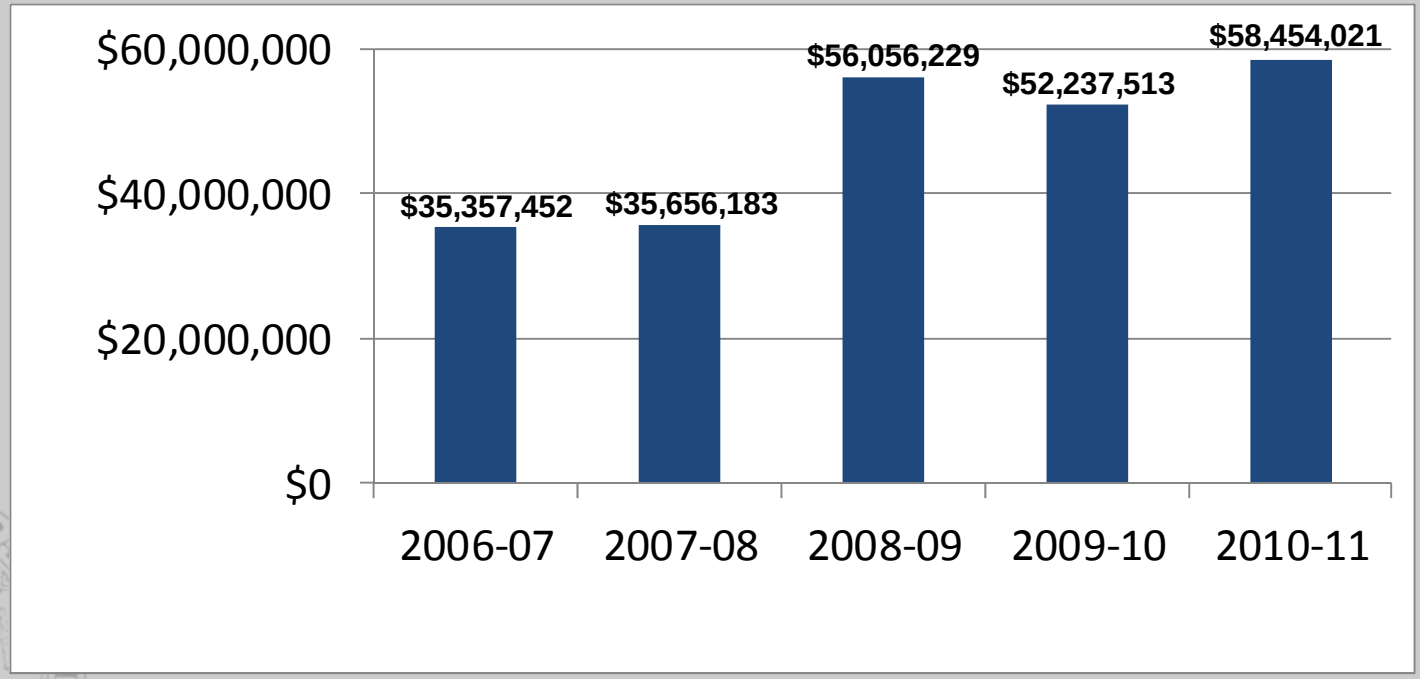
- Number of Applications: Short of Goal = +7 (+9%)
- Number of Awards: Did Not Meet Goal = -13 (-62%)
- Dollars Received from Awards: +$2,659,247 - No goal



Investment

Increase $ invested in University assisted companies by 5% per year

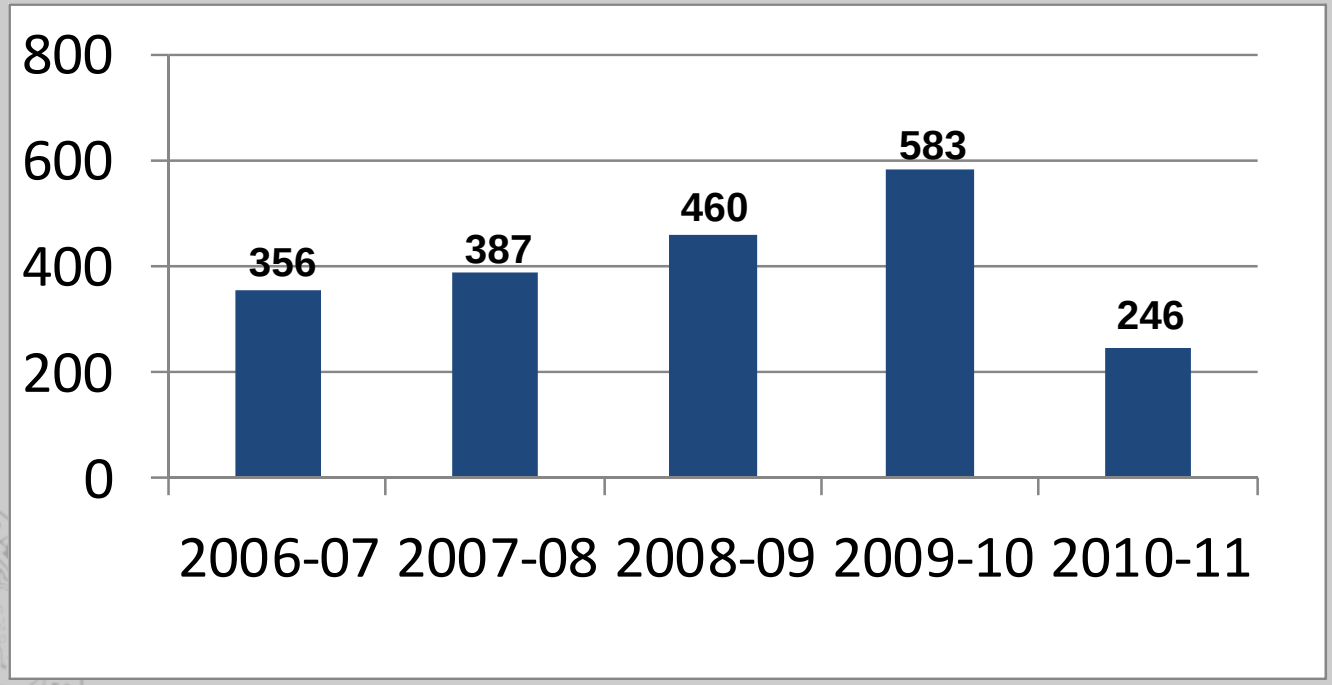
- Did meet goal = +$6,256,508 (+12%)



Start-ups

Increase University assisted business start-ups and transitions by 5%

- Did not meet goal = -337(-58%)



Recommendations for Accountability Measures

Reporting Period	Accountability Measure	Report Date	Reporting Committee
Spring 2013	1) Increase training hours invested by program participants by 5% of 55,104. 2) Increase number of clients assisted by 5% of 12,868. 3) Increase the number of SBIR/STTR applications by 10% of 84. 4) Increase the number of SBIR/STTR award amounts by 5% of 8. 5) Increase investment in NU assisted companies by 5% of $58,549,521. 6) Increase NU assisted business start-ups and transitions by 5% of 246.	April 2013	Academic
Spring 2014	Evaluate and modify annual targets as appropriate	April 2014	Academic
Spring 2015	Evaluate and modify annual targets as appropriate	April 2015	Academic

University of Nebraska Entrepreneurship Team (UNET)

Bob Bernier - Assistant Dean, Nebraska Business Development Center, UNO

Elizabeth Birnstihl - Associate Dean, Cooperative Extension Division, IANR

Anne Bowen – Executive Assistant/Project Coordinator for University Affairs, University of Nebraska

Lori Byrne – Assistant Director, Food Processing Center, IANR

Tom Chapman – Vice President, Nebraska Global

David Conrad – Executive Director, NUtech Ventures, UNL

Michael Dixon - Director, UNeMED Corporation, UNMC

Dale Eesley - Assistant Professor, Marketing and Management, UNO

John Falconer – Director, Sponsored Programs, UNK

Rolando Flores - Department Head, Food Science & Technology, IANR

Tom Field – Director of Engler Agribusiness Entrepreneurship Program, IANR

Mark Gustafson – Adviser, Engler Agribusiness Entrepreneurship Program, IANR

Matt Hammons - Director, Federal Government Relations, University of Nebraska

Mark Hutchison – Senior Manager of Food Innovation and Entrepreneurship, The Food Processing Center, IANR

Shawn Kaskie – Director, Center for Rural Research/Development, UNK

Peter Kotsiopulos – Senior Adviser to the President, Economic Development, University of Nebraska

James Linder – President, University Technology Development, Corp.

Jake Messersmith – Assistant Professor, Management, UNK

Mike McGinnis – Executive Director, The Peter Kiewit Institute

Sam Nelson – Lecturer, Center for Entrepreneurship, UNL

Connie Reimers-Hild - Associate Extension Educator, Southeast Research & Extension Center, IANR

Dusty Reynolds – Greater Omaha Chamber Entrepreneurship TAG

Marilyn Schlake – Assistant Extension Educator, Department of Agricultural Economics, IANR

Sandra Scofield - Director, Nebraska Rural Initiative, IANR

Weldon Sleight – Dean, Nebraska College of Technical Agriculture, IANR

Steven Schreiner – Senior Licensing Specialist, UNeMed Corporation – UNMC

Theresa Welbourne – Director, Nebraska Center for Entrepreneurship, UNL

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Renaming the Bachelor of Arts (BA) and Bachelor of Science (BS) majors, and BA and BS minors in International Studies to the Bachelor of Arts (BA) and Bachelor of Science (BS) majors, and BA and BS minors in Global Studies at the University of Nebraska-Lincoln (UNL)
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	January 16, 1999 – The name change in the Major in International Affairs in the College of Arts and Sciences at UNL to a Major in International Studies was reported to the Board
EXPLANATION:	International Studies generally focuses on states, their interactions, agreements, and diplomacy while Global Studies focuses on "globally shared" issues such as environment, people, cultures, and security. Given shifts in the curriculum, the new name change would more accurately reflect the focus of the curriculum and program. This proposal has been reviewed by the Council of Academic Officers.
SPONSOR:	Ellen Weissinger Senior Vice Chancellor for Academic Affairs
APPROVED:	Harvey Perlman, Chancellor University of Nebraska-Lincoln James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Expedited Approval of the University of Nebraska-Lincoln (UNL) Graduate Certificate in Digital Humanities
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	July 15, 2000 – The Board of Regents delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.
EXPLANATION:	The current and future demands for an interdisciplinary field that merges technology with traditional humanistic problems and concerns make this request for a graduate certificate in Digital Humanities a growing necessity. This certificate will serve as an appealing credential for graduate students seeking employment in universities, libraries, museums, and cultural institutions. The proposed certificate has been reviewed by the Council of Academic Officers.
PROJECT COST:	None
SPONSOR:	Linda R. Pratt Executive Vice President and Provost Dean of the Graduate College
APPROVED:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Expedited Approval of the University of Nebraska-Lincoln (UNL) Graduate Certificate in Intellectual, Sensory and Developmental Disabilities
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	July 15, 2000 – The Board of Regents delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.
EXPLANATION:	The certificate program represents an integrated study of disabilities and disorders (early childhood, vision impairments, deaf and hard of hearing, and severe disorders/autism) that may co-exist in students who are enrolled in special education classes. The audience for this certificate includes K-12 teachers, special educators, speech-language pathologists, school administrators, physical/occupational/speech therapists, and psychologists and interpreters. The certificate courses are offered as part of the Special Education and Communication Disorders faculty teaching loads and no new classes will be needed. The proposed certificate has been reviewed by the Council of Academic Officers.
PROJECT COST:	None
SPONSOR:	Linda R. Pratt Executive Vice President and Provost Dean of the Graduate College
APPROVED:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Expedited Approval of the University of Nebraska-Lincoln (UNL) Graduate Certificate in Transdisciplinary Childhood Obesity Prevention
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	July 15, 2000 – The Board of Regents delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.
EXPLANATION:	As childhood obesity reaches an epidemic level, public health departments, school wellness programs, and medical centers have a critical need for professionals trained in childhood obesity prevention. This certificate program will allow graduate students already focusing on projects in childhood obesity the ability to enhance their courses of study and research.. The concentration will increase their marketability in food and nutrition-related professions. The proposed certificate has been reviewed by the Council of Academic Officers.
PROJECT COST:	None
SPONSOR:	Linda R. Pratt Executive Vice President and Provost Dean of the Graduate College
APPROVED:	James B. Milliken, President University of Nebraska
DATE:	March 19, 2012

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Expedited Approval of the University of Nebraska-Lincoln (UNL) Graduate Certificate in Financial and Housing Counseling in the Department of Child, Youth, and Family Studies
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	July 15, 2000 – The Board of Regents delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.
EXPLANATION:	The certificate establishes eligibility of students for two exams leading to the Accredited Financial Counselor (AFC) and Accredited Housing Counselor (AHC), credentials issued by the Association of Financial Counseling & Planning Education. The certificate program addresses needs of the targeted audience of the University Passport Program (UPP), an initiative of the eight institution alliance (GP-IDEA) focusing on higher educational needs of Military Personnel and Spouses. UPP is funded with a $1.5 million grant from the Department of Defense. The certificate, as a distance education program, has the potential to draw students from every branch of the military from within the U.S. and worldwide. The certificate courses are already offered as part of the Family Financial Planning program delivered through GP-IDEA and no new classes will be needed. The proposed certificate has been reviewed by the Council of Academic Officers.
PROJECT COST:	None
SPONSOR:	Linda R. Pratt Executive Vice President and Provost Dean of the Graduate College
APPROVED:	James B. Milliken, President University of Nebraska
DATE:	March 30, 2012

TO: The Board of Regents Addendum VIII-D-8

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Members of the University of Nebraska Project Review Board Pool

RECOMMENDED ACTION: Report

PREVIOUS ACTION: March 7, 2008 – A report was submitted to the Board of Regents listing members serving as the Project Review Board pool.

EXPLANATION: The University of Nebraska wishes to extend service of previously approved Project Review Board and appoint new members from within and without the University to serve in the Project Review Board pool. The members were previously selected by a selection committee, consisting of the Assistant Vice President for Business and Finance/Director of Facilities Planning and Management, and the Facility Directors of each campus, and make the following appointments.

External Members	Internal Members
John Badami, architect	Robert Dietrich, UNMC engineer
Douglas Bisson, planner	Scott Hunt, UNL planner
Patricia Birch, architect	Richard Kmiecik, UNMC engineer
Michael Brady, engineer	Lee McQueen, UNK engineer
Kevin Clark, architect	Chad Lea, UNL architect
Chris Ertl, architect	Dan Michalak, UNMC engineer
Thomas Findley, architect	Larry Morgan, UNO engineer
Donald Foster, engineer	Stefan Newbold, UNL engineer
Charles Huddleston, engineer	Ron Schaefer, UNMC architect
Lynn Jones, architect	Mark Sjogren, UNMC architect
Martin Kasl, engineer	Alan Wedige, UNK architect
Vishal Khanna, engineer	
JoAnne Kissel, planner	
George Morrissey, engineer	
Jack Pagel, engineer	
Chris Rupert, Planner	
Toby Samuelson, engineer	
Dennis Scheer, landscape architect	
Philip Schreier, engineer	
John Sinclair, architect	
Curt Witzenburg, architect	
Richard Woodson, engineer	
James Zavadil, engineer	

SPONSOR: Rebecca H. Koller
Assistant Vice President for Business and Finance
Director of Facilities Planning and Management

APPROVED: David E. Lechner
Vice President for Business and Finance

DATE: March 19, 2012

TO: The Board of Regents Addendum VIII-D-9

Business Affairs

MEETING DATE: April 13, 2012

SUBJECT: Business Affairs Committee Approval of Intermediate Design Report

RECOMMENDED ACTION: Report

PREVIOUS ACTION: November 7, 2008 - The Board of Regents approved revisions to RP-6.3.6.2.d authorizing the Business Affairs Committee to approve Intermediate Design for projects greater than $2,000,000 and report approval to the Board at the next regular meeting. Approval of Intermediate Design fixes the project scope and budget.

EXPLANATION: Following is the Intermediate Design Report as approved by the Business Affairs Committee:

UNL – Outdoor Adventures Center

Program Statement Approved: June 17, 2011
Intermediate Design Report: March 21, 2012

	Program Statement	*Intermediate Design*
Total Project Cost:	$4,695,000	$4,695,000
Construction Cost	$3,842,000	$4,067,135
Non Construction Cost:	$853,000	$627,865
NSF:	8,500	9,353
GSF:	13,000	13,250
Substantial Completion	August 2013	September 2013

SPONSOR: Rebecca H. Koller
Assistant Vice President for Business & Finance
Director of Facilities Planning & Management

APPROVED: David E. Lechner
Vice President for Business & Finance

DATE: March 19, 2012

TO:	The Board of Regents Business Affairs	Addendum VIII-D-10
MEETING DATE:	April 13, 2012	
SUBJECT:	University of Nebraska at Kearney Facilities Development Plan Update	
RECOMMENDED ACTION:	Report	
PREVIOUS ACTION:	The University of Nebraska at Kearney 2006-2015 Facilities Development Plan was approved by the Board of Regents on January 19, 2007. The presentation identified the overall campus goals and planning concepts for the ten year period.	
EXPLANATION:	RP-6.3.6 outlines the process for developing efficient and quality facilities necessary for the University to provide Nebraskans educational and economic opportunities. As part of the master planning phase the Facilities Development Plan is reviewed every five years. The attached report outlines the planning imperatives, process, data analysis, assumptions, concepts, and implementation recommendations that will serve as the basis for the 2016-2025 Plan.	
SPONSOR:	Rebecca H. Koller Assistant Vice President for Business and Finance Director of Facilities Planning and Management	
APPROVED:	David E. Lechner Vice President for Business and Finance	
DATE:	March 19, 2012	

University of Nebraska At Kearney 2006 to 2015 Facilities Development Plan

Mid-Plan Progress Report, April, 2012

The University of Nebraska at Kearney Facilities Development Plan 2006-2015 approved in January, 2007, lays out a vision of opportunities for the future development of UNK, considering the historic Main Campus, and the adjacent property currently called South Campus.

12 major projects have been completed, are underway, or are in planning, since UNK adopted the 2006 Development Plan. And, this list excludes the pending development of South Campus.

Planning Imperatives

The University of Nebraska at Kearney Facilities Development Plan 2006-2015 was designed to integrate with the Strategic Planning Framework adopted by the Board of Regents, as well as the role, mission, and core values of UNK. At that time, we envisioned facilities development tasks undertaken would produce the following outcomes:

- "RESIDENTIAL RENEWAL – We will renew our residential capabilities with new or refurbished residence halls that offer a variety of housing choices. These facilities, along with a multi-faceted Student Union…, will provide the main infrastructure supporting student development outside the classroom and laboratory."

  In 2006, the housing inventory offered about 15% of beds in spaces less than 40 years old. These were served by gang showers lacking the privacy typically expected by incoming students. Accessibility to upper floors in most halls was limited at best. Only 16% of beds were sprinkled.

  A plan for constructing over 160,000 new square feet for 332 beds was approved by Board of Regents in December, 2005. This project developed Antelope (2007) and Nester Halls (2008) as two- and four-bedroom suite-style housing. Development of this suite-style housing broadened campus living options, especially for returning residents. This project was funded by sale of revenue bonds.

  A plan for renewing the remaining, older halls was reviewed with Board of Regents in March, 2008. This plan included renovating and razing buildings to achieve an appropriate number of beds in support of the university's residential mission.

  Plans were developed and projects completed in Mantor (2009), Men's (2010) and Randall (2011) Halls to improve over 170,000 square feet of existing space. Life-safety improvements included the addition of fire sprinkler systems, replacement of fire alarm systems. Accessibility was expanded by installation of elevators. Renovations to gang showers focused on privacy and accessibility. New space conditioning systems were installed for Men's, adding cooling and improving heating for these rooms. These projects were funded from revenue bond surplus funds. Windows in Mantor and Randall were replaced using revenue bond surplus funds to match Nebraska Energy Office grant funds.

  Additional work is needed to complete this renewal plan. Renovations are planned to begin in Centennial Towers West in May, 2012; Centennial Tower East in May, 2013. Martin Hall will no longer be used as a residence hall after these projects are completed, as part of right-sizing the

number of available beds. New space will be developed to replace the University Heights apartments. Martin Hall renovations and University Heights are discussed further, below. Upon completion, all campus sleeping quarters will be sprinkled, and over 35% of beds are in spaces less than 20 years old.

Not all older halls are being renovated. Conrad Hall will be razed as part of the Martin Hall renovations, see below. Case and Ludden Halls were razed as part of the Antelope and Nester development. Stout Hall was razed during Randall renovation. It was determined that the benefit of renovating these spaces for these few beds was outweighed by their funding needs for structural, accessibility, heating and cooling, and other improvements.

Parallel to these improvements are recent renovations to UNK dining facilities. These projects upgraded room finishes, expanded preparation space, and increased seating space, all focused on improving customer experience.

- ENVIRONMENTAL ENHANCEMENT – "Landscape to promote beauty and functionality; move vehicular traffic increasingly to the campus perimeter; building architecture and grounds development initiatives will maintain the "academic village" nature of main campus."

  Many architecture improvements have been made to campus during this first portion of the planning period. Antelope and Nester developed interior and exterior spaces that encourage student interaction and collaboration. Bruner Hall developed interior and exterior destination sites. The development of Central Utility Plant on University Drive changes the image of the site from a neglected space to one worthy of notice.

  The razing of Stout Hall provides the opportunity to improve the entry into Randall and Mantor Halls. The planned new entry will develop a mid-campus focal point along the growing pedestrian mall. Parking spaces west of Cope Fountain have been used as staging area during construction of Men's and Randall renovations, and will be used during the completion of this entry. When construction is complete, the area will be converted to green space. The pedestrian mall will then extend from the View, which connects north and south portions of Nester Hall, to the location of this new entry. Other landscaping initiatives continue, including tree replacements (impact of storms, adding diversity), garden areas, and standardizing site furniture.

  One planned enhancement will move some campus traffic to the perimeter. Office of Admissions is a common destination for campus visitors. Its present location in Memorial Student Affairs Building requires visitors to travel into the heart of campus. Relocating Admissions to Martin Hall on the campus perimeter re-uses an available resource while creating an easily accessed destination.

  Purchase of the property at 9th Avenue and 25th Street allowed additional environmental enhancements to the campus. The initial benefit of this effort was razing the existing buildings. This provides visitors a better visual access to that portion of campus. The addition of this property also allowed the opportunity to enter into discussions with City of Kearney concerning improvements to this awkward intersection. Concepts have ranged from simple reconfiguring to develop a signalized tee intersection, to construction of a dual lane roundabout.

- ACADEMIC INFRASTRUCTURAL RENEWAL –"We will modernize the infrastructure supporting our academic mission…. Planners will respect UNK's historical commitment to small-class sizes and comprehensive undergraduate research capability throughout the curriculum. UNK's information technology infrastructure will feature comprehensive wireless networking capability in every

building. The infrastructure will support on- and off-campus teaching, outreach, and student support services as well as administrative computing."

The renovation of Bruner Hall of Science improved 84,900 existing square feet. This project also constructed a 17,800 square feet addition, replacing a 200- seat lecture hall, two small lecture halls and a sub-grade planetarium. This project addressed deficiencies and met the goals of the College of Natural and Social Sciences, including:

- Providing quality laboratory space to support the teaching, learning and research activities;
- Providing adjacent classroom space to support the non-laboratory classes.
- Providing classrooms better matching typical class size.
- Providing a larger planetarium with high public visibility and accessibility.
- Providing space for students to collaborate, study, socialize and build a sense of community.

This project was funded with revenue from LB605, and a grant from NASA.

Proper support for this and other academic operations requires reliable utility service, including dependable and efficient delivery of thermal needs. Construction of the Central Utilities Plant improves the academic environment by meeting this need. This development followed industry practice for reliability by installing N + 1 boilers and chillers, that is, the largest unit could be off-line and still meet peak loads. Improvements resulting from plant location allow significant future load growth with reduced investment in distribution. This project was also funded from revenue from LB605.

Recent improvements to Ryan Library include the development of a Learning Commons. This is the first facility of its kind in the state, and brings together UNK Writing Center, Academic Peer Tutoring, additional group study rooms, and other services and activities focused on student academic success.

West Center projects include development of the Global Marketing Research Lab, providing students with hands-on learning opportunities. The room is equipped with a state-of-the-art Smart Board, and two-way mirror with an adjourning observation room with ear phones and TV monitor for collecting focus group data. Not only can students learn the skills of conducting marketing research but they are able to fine tune their presentation skills using this facility. The facility can also be utilized by regional businesses needing to conduct research.

Data Analysis

In 2006, assumptions on space management were based on reaching a goal of 7,500 FTE by the end of the planning period. In 2009, an Enrollment Management Council was initiated, to establish and monitor enrollment and retention goals. This group, working with Noel Levitz consultants, revised the enrollment goal to 7,100 students. UNK reached this goal in fall, 2011.

Planning Concepts, Recommendation

The planning imperatives, and related goals noted above, also led to initial planning for several future projects:

Wellness Center
A new Wellness Center is proposed to be located adjacent to Cushing Fieldhouse. This project will provide a facility for teaching and research on health and human performance, student fitness activities, and wellness programming for students, faculty, and staff.

The new Wellness Center will enhance UNK's ability to apply university expertise to citizens' needs, by locating a major center of health and wellness teaching and research in modernized, readily accessible facilities at the heart of campus. It also addresses a need identified by both students and administrators to augment current facilities for student recreation, fitness activity, and associated co-curricular programming.

The Wellness Center will provide new space and equipment for student recreation and fitness activity and for a variety of organized activities including cheerleading and dance team practices, group instruction/training and club meetings.

The Center will also provide new instructional, research, meeting and exercise space for the Human Performance Laboratory (HPL), a core element of UNK's priority program in Exercise Science and supported in part by Program of Excellence (POE) funding. The teaching and scholarship of HPL faculty relate directly to campus and community health and wellness. The Laboratory is now housed in a space that is programmatically overcrowded. With recent HPL growth (including POE funding for two new faculty researchers), the limitations of the existing facility have become significant constraints on its programs and potential impact.

Otto Olsen
The proposed project will provide the first major renovation of the Otto Olsen Building. Ongoing deferred maintenance and ADA projects have been completed using TF309 and LB1100 funding to address the buildings immediate shortcomings. The 66,000 square foot facility was built in 1954 in the original academic core of the campus.

The original mechanical, electrical distribution and lighting systems are still in use in most areas of the building.

The proposed project is related to Deferred Maintenance, Code, Fire and Life Safety Issues and meeting today's educational needs. Department growth and changes have made renovation of the west wing and child care addition impractical. Study and planning are underway to relocate programs in the College of Business and Technology. The present concept, renovating a portion of the existing structure and relocating some departments to other locations on campus, provides the most cost effective alternative that conforms to the comprehensive plan for the University. Should the proposed College of Nursing and Allied Health become a reality, relocating Nursing away from West Center could be a first step in advancing these Otto Olsen projects.

South Campus Development
Previous plans have considered the potential of the South Campus property for development. UNK will begin in March, 2012, a formal feasibility study for this property.

One use of this property will be the replacement for University Heights apartments. This development will complement and complete current residential renewal efforts. The initial development will replace the existing complex with a variety of modern one- and two-bedroom units. Intended initial capacity is about 100 units; future expansion could increase this by 50%. These units

are intended to be appropriate for broad group of customers, ranging from traditional upper class students, to non-traditional students with families, to in-coming faculty.

The development concepts for this site may include restaurants, stores and other retail spaces. Site planning also considers relocating Child Development Center to this site. With a waiting list equal to its current capacity, the current operation suffers from its success. Relocating this non-academic function to the new site allows for expansion, improving short-term parking for picking up and dropping off children, frees space on main campus, and reduces mid-campus traffic. Developing this function adjacent to the apartment complex complements both functions.

The development plan is expected to be completed during the 2012 calendar year.

College of Nursing and Allied Health
A recent legislative study revealed a nursing shortage of 3,800 professionals within the next eight years. Rural areas are especially vulnerable to this shortage. Other health providers such as physician assistants, physical therapists, clinical laboratory scientists, radiographers and diagnostic sonographers are often not available outside our major communities.

The University of Nebraska Medical Center and University of Nebraska at Kearney have joined to develop and promote plans to address this urgent need.

UNMC's nursing program has been offered for 20 years in Kearney. UNMC Allied Health Science programs also have a strong tradition at UNK through the Rural Health Education Network and the Kearney Health Opportunity Program.

Building a Healthier Nebraska would include a first-class UNK/UNMC Health Science Education complex co-located with UNK's existing Bruner Hall of Science. Sophisticated labs and distance technology would bring UNMC programs to UNK. No longer would students have to leave rural Nebraska to receive UNMC's quality programs. There are 180 pre-nursing students at UNK. Nearly 50 percent of the qualified applicants are turned away because of inadequate space and labs.

The number of allied health students at UNK has doubled in 10 years from 323 majors in 2001 to 711 last year. Clearly, there is great interest in allied health, but only 25 percent of the applicants can be accepted. Expanding allied health programs to UNK will grow the number of health care providers, and it is likely that those students would stay in rural Nebraska.

Quality health care will be a key to keeping all of Nebraska an attractive place to live. Building a Healthier Nebraska is a great investment in strengthening health care access and quality in rural Nebraska.

Date for next master plan presentation:

The goals noted in the 2006-2015 plan are recommended to remain unchanged during the remaining planning period. The next UNK 10 year facilities development plan presentation is scheduled for the fall of 2016.

UNK is scheduled for review by North Central Accreditation in 2014. The self-study will be conducted during calendar 2013, and data and information from that study will be the basis for the next round of facilities planning.

TO:	The Board of Regents	Addendum VIII-D-11
	Business Affairs	
MEETING DATE:	April 13, 2012	
SUBJECT:	Report of Bids and Contracts	
RECOMMENDED ACTION:	Report	
PREVIOUS ACTION:	None	
EXPLANATION:	The attached report is a summary of bids and contracts as provided by the campuses pursuant to Section 6.4 of the *Bylaws of the Board of Regents of the University of Nebraska* for the period ended March 19, 2012. The report outlines the following: type of action; campus; description and use of the product, service, or project; funding source; approved budget amount; contract amount; contractor or vendor; and a bid review or bid explanation if the low responsible bid was not accepted.	
APPROVED:	David E. Lechner Vice President for Business and Finance	
DATE:	March 19, 2012	

University of Nebraska
Business Affairs Report – Bids and Contracts

Period Ending: March 19, 2012
Meeting Date: April 13, 2012

Type of Action	Campus	Description	Funding Source	Approved Budget Amount*	Contract Amount	Contractor / Vendor	Bid Review or Explanation
Construction Contract	UNMC	Wittson Hall HVAC Upgrades	LB 605	$5,090,000	$2,286,000	Prairie Construction	Low Responsible Bid
Construction Contract	UNMC	Eppley Cancer Institute Renovation	LB 605	11,900,000	8,207,300	W Boyd Jones Const	Low Responsible Bid
Construction Contract	UNMC	Eppley Cancer Institute Renovation	LB 605	11,900,000	315,275	Siemens Industry	Low Responsible Bid

*Approved budget amount for construction contracts represents the entirety of the project budget, whereas the contract amount is the amount pertaining to the particular activity within the construction contract.

Additional Item
Addendum VIII-D-12

TO:	The Board of Regents Academic Affairs
MEETING DATE:	April 13, 2012
SUBJECT:	Assessing Student Learning Outcomes: Licensure Results
RECOMMENDED ACTION:	Report
PREVIOUS ACTION:	April 29, 2011 – The Assessing Student Learning Outcomes: Licensure Results report was provided to the Board
EXPLANATION:	The licensure results are provided as part of the Strategic Framework Goal 6-g. We report on licensure examinations that allow national comparisons. The latest results follow recent trends and again were exemplary. (See attached table on the following page.)
REPORTED BY:	Kristin E. Yates Assistant Vice President and Director of Institutional Research
DATE:	April 11, 2012

Strategic Framework 6.g.iii Student Learning and Success Outcomes

Accountability Measure:

1) Annual or other periodic review, as available, by the Board of performance on standardized examinations and surveys.

UNMC Licensure Exam Pass Rates				
Exam		2009	2010	2011
MD Step 1	UNMC	91	92	94
	National	93	92	94
MD Step 2	UNMC	99	100	100
	National	97	97	97
Nursing	UNMC	93	94	96
	National	88	94	89*
Pharmacy	UNMC	100	100	100
	National	98	95	94
Physical Therapy	UNMC	100	100	100
	National	87	88	89
DDS Part 1	UNMC	98	100	100
	National	92	92	94
DDS Part 2	UNMC	98	93	98
	National	93	80	94
Dental Hygiene	UNMC	100	91	100
	National	96	96	96

* Nursing Baccalaureate figure

2011 Key Facts

•UNMC met or exceeded the national pass rate for all areas we measure, except one.

•UNL students exceed the national pass rate for the bar exam by 12 percentage points.

UNL Bar Examination Pass Rates		
Year	UNL	National
2009	91%	74%
2010	95%	73%
2011	91%	79%