

**Graduate Degree Program Pre-Proposal
Example and Templates**

Example: Pre-proposal submitted by the College of Engineering for an M.S. and Ph.D. Program in Environmental and Ecological Engineering (EEE), Purdue University, West Lafayette

PRE-PROPOSALS SHOULD INCLUDE THE FOLLOWING:

**COVER PAGE
FOR DEGREE PROGRAM PRE-PROPOSALS**

INSTITUTION: _____(Purdue University)_____

CAMPUS: _____

COLLEGE: _____

DEPARTMENT/SCHOOL: _____

DEGREE PROGRAM TITLE: _____

SUGGESTED CIP CODE: _____

PROJECTED DATE OF IMPLEMENTATION: _____

PRE-PROPOSAL SIGNATURE PAGE

Degree Title: _____

Name of academic unit offering the new degree:

(Include signatures from all involved programs)

_____ Signature of Department Head (Name of Department)	_____ Date
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_____ Signature of Academic Dean (Name of College/School)	_____ Date
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_____ Director of Graduate Studies (for regional campuses)	_____ Date
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PURDUE UNIVERSITY BOARD OF TRUSTEES

TEMPLATE FOR
1-PAGE EXECUTIVE SUMMARY

INTRA-AGENCY ADVISORY AND DELIBERATIVE MATERIAL

MEMORANDUM

Executive Summary of Upcoming Board Review or Action Item

DATE: February 23, 2015

TO: Board of Trustees

FROM: John Sutherland, Primary Contact, (765) 496-9697; jwsuther@purdue.edu

CC: Nina Robinson, Secondary Contact, (765) 496-7578; nlrobins@purdue.edu

SUBJECT: Submission of Proposal for an M.S. and Ph.D. in Environmental and Ecological Engineering

Purpose:

- This item is recommended for discussion by the Board in executive session.
- This item is recommended for discussion by the _____ Committee at its meeting.
- X** This item will require a formal vote by the Academic Affairs Committee at its meeting.
- This item will require a formal vote by the Board in the Stated Meeting.
- This item will be presented in a formal resolution for action at the Stated Meeting.

Attachments: [List any attachments to the memo as Exhibits or Appendices or note, "No Attachments"] No Attachments

Executive Summary (1-page) included: [Provides a high level narrative and should provide some interpretative commentary surrounding any data or other graphical information being provided in any attachments.]

Concluding thought: The purpose of the Executive Summary is to ensure the trustees know an item will be discussed at the meetings, to give them a general understanding, and to provide contact information if they have early questions. Please keep it to one page, and limit attachments to only those needed to provide a useful introductory overview.

EXECUTIVE SUMMARY

M.S. & Ph.D. in Environmental and Ecological Engineering College of Engineering, Purdue University, West Lafayette

The College of Engineering at Purdue University is proposing the creation of the Environmental and Ecological Engineering (EEE) graduate degree program. This program will provide a leadership role in Indiana's economic and social development by preparing EEE graduates to join a high quality educated workforce in an area of national need. The creation of graduate degrees in Environmental and Ecological Engineering will contribute to meeting the strategic goals of the university by providing affordable, accessible, and pedagogically-structured education and research programs. The formalized degree programs will provide vital transformative STEM education and world changing research opportunities for graduate students. Currently there are no graduate degree programs in Environmental Engineering at Purdue University or at a public institution in the state of Indiana. The labor market demand for EEE graduates is strong. Based on data from the US Bureau of Labor Statistics the national growth rate of employment in this field is projected to be greater than 15%. Growth in Indiana is projected to be much faster than the national rate at greater than 29%. Recent data reveals that 35.5% and 5.0% of environmental engineering workers (25 years and older) had attained a Master's and Doctoral (or professional) degree, respectively. For EEE undergraduates an accessible 4 + 1 Master's degree will be integrated with the BSEEE allowing students to earn a graduate credential in only two additional semesters.

The name 'Environmental and Ecological Engineering' highlights an innovative approach to managing complex problems with an integrated perspective that considers both environmental issues and ecological interactions. The EEE curriculum trains engineers to apply their technical understanding of systems engineering, biology, and chemistry to develop strategies to protect human and environmental health. Environmental impacts are a consequence of human development and the practice of every discipline of engineering. EEE seeks to lead in the education of all disciplines of engineering in how to incorporate design, practices and processes that are more harmonious with the earth's ecosystems. This guiding philosophy incorporates unique qualities relative to peer institutions such as a Systems perspective on environmental issues, Meta-disciplinary team oriented course work and a focus on ecological interactions and resilient designs that take into account complexity and connectivity among systems. All Ph.D. students will be required to complete a research dissertation. Master's students will have the option of participating in research but may complete a course work only degree.

The program builds upon the strengths of Purdue by leveraging resources and space from established units such as Civil Engineering, Agricultural and Biological Engineering, Industrial Engineering, and Materials Engineering at Purdue University. These Purdue graduate engineering programs have some connections to environmental engineering, thus potential synergy and collaborations exist with the EEE graduate degree program. At present, graduate level degrees in environmental engineering represent a gap within the Purdue Engineering system. However, several graduate engineering programs may be considered as being synergistic to the proposed graduate degree programs. The traditional areas of environmental engineering are closely linked to programs in Agricultural and Biological Engineering and Civil Engineering, whereas the emerging areas such as sustainability and industrial ecology are linked to all engineering disciplines.

PRE-PROPOSAL

M.S. and Ph.D. in Environmental and Ecological Engineering to be Offered by Purdue West Lafayette

1. Characteristics of the Program

- a. *Campus Offering Program*: Purdue University, West Lafayette
- b. *Scope of Delivery (Specific Sites or Statewide)*: Purdue University West Lafayette campus
- c. *Mode of Delivery (Classroom, Blended, or Online)*: Classroom teaching by Environmental and Ecological Engineering (EEE) faculty with integration of modern techniques, technology and lab experiences related to EEE.
- d. *Other Delivery Aspects (Co-ops, Internships, Clinicals, Practica, etc.)*: M.S. students will have the option of participating in research, Ph.D. students will be required to participate in research.
- e. *Academic Unit(s) Offering Program*: College of Engineering, Purdue University, West Lafayette

2. Rationale for the Program

- a. *Institutional Rationale (Alignment with Institutional Mission and Strengths)*
Purdue University is proposing the Environmental and Ecological Engineering (EEE) graduate degree program because it will play a leadership role in Indiana's economic and social development by preparing EEE graduates to join a high quality educated workforce in an area of national need.

The EEE graduate degree program will contribute to the mission of Purdue University by serving the citizens of Indiana, the United States, and the world through dissemination of knowledge which prepares our graduates to succeed as leaders, professionals, informed consumers, responsible citizens, and lifelong learners. Primary missions that the university fulfills for the State of Indiana and the nation are graduate education to prepare people to enter the workforce and research to advance economic prosperity, ecological stewardship and social well-being. The proposed EEE graduate program is consistent with Purdue's role as a major research university and as one of the nation's leading and comprehensive engineering programs.

The creation of graduate degrees in Environmental and Ecological Engineering will contribute to meeting the strategic goals of the university by providing affordable, accessible, and pedagogically-structured educational and research programs. The formalized degree programs will provide vital transformative STEM education and world changing research opportunities to graduate students.

The program can build upon the strengths of Purdue by leveraging resources and space from established units such as Civil Engineering, Agricultural and Biological Engineering, Chemical Engineering, and Materials Engineering at Purdue University. These Purdue graduate engineering programs have some connections to environmental engineering, thus potential synergy and collaborations exist with the EEE graduate degree program. At present, graduate level degrees in environmental engineering represent a gap within the Purdue Engineering system. However, several graduate engineering programs may be considered as being synergistic to the proposed graduate degree programs. The traditional areas of environmental engineering are closely linked to programs in Agricultural and Biological Engineering and Civil Engineering,

whereas the emerging areas such as sustainability and industrial ecology are linked to all engineering disciplines.

Interdisciplinary Ecological Sciences & Engineering (IESE) is a non-degree granting Interdisciplinary Graduate Program at Purdue University. IESE students join and graduate from the degree program of their major professor. IESE students in a sense maintain “dual citizenship” in both IESE and their degree home. Many current EEE faculty are active in the IESE program. EEE and IESE will build a complementary mutually beneficial partnership. EEE will add a relevant and needed engineering degree home option for IESE students. IESE will continue to provide an interdisciplinary community in which students receive mentoring and a place to develop their professional skills. The development of EEE will serve to expand opportunities for IESE students and increase the impact of the IESE program.

Faculty membership in EEE is inherently multi-disciplinary as reflected in EEE teaching and research collaborations with other schools (Aeronautics and Astronautics, Agricultural and Biological Engineering, Civil Engineering, Chemical Engineering, Electrical and Computer Engineering, Industrial Engineering, Mechanical Engineering, Materials Engineering) and numerous centers at Purdue.

- b. *State Rationale “Reaching Higher, Achieving More calls for institutions to develop programs that advance the specific mission and strengths of each institution.”*

The program addresses the priorities of completion, productivity and quality reflected in *Reaching Higher, Achieving More*. An accessible 4 + 1 Master’s degree will be integrated with the existing BSEEE degree allowing students to attain an advanced degree in only two additional consecutive semesters (a proposal will be submitted to the Purdue Graduate School for this option.). Citizens with advanced degrees earn higher salaries and contribute more to local and regional economic prosperity. The 4 + 1 option is more affordable, increases programmatic productivity and provides incentives to students to achieve completion. Moreover, *Reaching Higher, Achieving More* calls for institutions to develop programs that advance the specific mission and strengths of each institution. The proposed EEE graduate degree program will have a significant positive impact on other graduate programs at Purdue. The unique interdisciplinary structure in which the core traditional disciplines of engineering, and sciences beyond engineering, contribute to the EEE mission will foster greater interaction and collaboration among the Purdue University community. The EEE structure is an innovative model that optimizes responsiveness to educational and economic demands and challenges in a financially efficient and effective manner. By utilizing existing space, courses and faculty across much of the College and University, EEE is contributing to a fuller utilization of existing resources.

- c. *Evidence of Labor Market Need*

- i. *National, State, or Regional Need*

The EEE graduate degree program will serve the national and state need for environmental engineers. According to the U.S. Bureau of Labor Statistics, the outlook for the availability of environmental engineering jobs is positive at all degree levels (B.S., M.S., and Ph.D.). It is forecast to be one of the fastest growing engineering disciplines over the next decade with growth projected to be greater than 15%. On a national and state level more job openings are

expected in environmental engineering than in aerospace, agricultural, chemical or materials engineering.

ii. Preparation for Graduate Programs or Other Benefits

The best students earning a Master's degree from the EEE graduate degree program will be prepared and qualified to enter an environmental engineering Ph.D. program at Purdue or any other top institution.

iii. Summary of Indiana DWD and/or U.S. Department of Labor Data

The labor market demand for EEE graduates is strong. The U.S. Bureau of Labor Statistics forecasts the rate of growth for employment in environmental engineering to be 15.3%, faster than the combined rate of all engineering fields at 8.6%. It is anticipated by 2022 that upwards of 21,100 jobs will be available for new graduates (8,200 is the growth, the remainder of the positions will be replacement positions). This is taking into account both job growth and replacement due to retirements and transfers out of the field. The job prospects for a qualified individual with an advanced degree in environmental engineering is better than entering the workforce with only a baccalaureate degree according to the Bureau of Labor Statistics. In 2010-2011, 35.5% and 5.0% of the environmental engineering workers (25 years and older) have attained Master's and Doctoral (or professional) degree, respectively.

iv. National, State, or Regional Studies **(to be included in full proposal)**

v. Surveys of Employers or Students and Analyses of Job Postings **(to be included in full proposal)**

vi. Letters of Support (See Appendix C)

3. Cost of and Support for the Program (to be included in full proposal, includes Table 1)

4. Similar and Related Programs (to be included in full proposal)

5. Quality and Other Aspects of the Program

a. *Credit Hours Required/Time To Completion*

- *Credit hours required for the program and how long a full-time student will need to complete the program*

The minimum requirements for the specific number of course credit hours are:

- Master's non-thesis: 30 hours of course work
- Master's thesis: 21 hours of course work and 9 hours of appropriate EEE 69800 research hours with the student's advisor.
- Ph.D.: 48 hours of course work and 42 hours of appropriate EEE 69900 research hours with the student's advisor.

Full-time status requires enrollment in 8 credit hours per semester or 6 credit hours in the summer session. Typically graduate students enroll in 9 - 12 total credit hours (courses + research). Thus, a Master's student enrolled in 9 -12 credit hours of combined course work and/or research credit per semester can complete the program in three regular semesters. A Ph.D. student enrolled in 9 -12 credit hours of combined course work and research credit per semester would complete the program in three years (six regular semesters and one summer session) beyond the Master's degree.

b. *Exceeding the Standard Expectation of Credit Hours*

Not applicable

c. *Program Competencies or Learning Outcomes*

- *List the significant competencies or learning outcomes that students completing this program are expected to master.*

The Learning Outcomes for the graduate degree program in Environmental and Ecological Engineering are adapted from the Environmental Engineering Body of Knowledge developed under the auspices of the American Academy of Environmental Engineers & Scientists.

1. Ability to apply mathematics, physics, chemistry, biology, ecology and earth science knowledge in design.
2. Ability to design and conduct experiments to gather data for use in analysis and design.
3. Use modern engineering tools required for engineering practice.
4. Ability to incorporate risk assessment to manage uncertainty and ensure reliability.
5. Ability to formulate and evaluate alternative engineering strategies.
6. Ability to design a system, component or process to meet desired needs.
7. Ability to integrate the principles of sustainability into analysis and design.
8. Recognize and communicate the societal impact of engineering activities.
9. Ability to function in a globalized system while maintaining awareness of emerging contemporary issues.

10. Ability to thrive in Multi-Disciplinary Teams
11. Commitment to practice engineering in a professional and ethically responsible manner.
12. Ability to effectively communicate with the non-technical public as well as the technical community.

d. Assessment

The level of achievement for mastering learning outcomes becomes greater as students advance through the Master's degree, and more so through the Ph.D. degree. The level of achievement continues to grow through professional practice. In order to assess whether students master learning outcomes appropriate for their degree, course content will be mapped to the program learning outcomes. An advisory committee composed of the Graduate Faculty will review the Plan of Study of each student to ensure that program learning outcomes are achieved at the appropriate level. Each student must obtain approval for a Plan of Study from their Graduate Advisory Committee. The Graduate School regards the Plan of Study as an individualized curriculum designed by the advisory committee to assist a student in achieving career objectives and programmatic educational outcomes.

e. Licensure and Certification

Graduates of this program will be prepared to earn the following:

- *State License:*

Graduates of the Master's and Ph.D. program in Environmental and Ecological Engineering will be prepared to earn a Professional Engineering license through the State of Indiana's Professional Licensing Agency.

- *National Professional Certifications (including the bodies issuing the certification):* Graduates of the Master's and Ph.D. program in Environmental and Ecological Engineering will be prepared to earn board certification from the American Academy of Environmental Engineers & Scientists.

- *Third-Party Industry Certifications (including the bodies issuing the certification):* The EEE graduate program is not intended to prepare students for any specific third party certifications.

f. Placement of Graduates

Environmental and ecological engineers are employed in government service, consulting service, industry, and education. The basic skills required in each sector are similar. Most environmental engineers in supervisory or project leadership positions have Master's degrees and an increasing number of environmental engineers in the discipline have doctoral degrees. Frequently environmental and ecological engineers are responsible for large and complex projects and supervise or coordinate with engineers from other disciplines. A broad technical background

provided by advanced education and experience is essential for this responsibility. As EEE students approach graduation there will be numerous opportunities for guidance and mentoring for job placement. The Purdue University Center for Career Opportunities (CCO) provides all Purdue students a full range of services including workshops on resume building, interviewing, networking and negotiating. The CCO organizes career fairs and hosts a web based information exchange where students can post resumes and employers can post job openings. In addition to the CCO, other organizations such as professional engineering societies and academic programs host career fairs. Furthermore, many large companies organize their own “day on campus” where students have an opportunity to meet directly with recruiters. All EEE graduate students will have a faculty mentor. Purdue faculty have a strong network among professional practitioners. The EEE program extends this professional network through an active Advisory Council comprised of professionals with advance educational credentials (Master’s and PhD’s) and experience working in the discipline. The faculty who are collaborating to launch the EEE graduate program have a substantial record of mentoring graduate students in the environmental engineering discipline. Historically the placement of graduate students mentored by this cohort of faculty is 100%.

g. Accreditation

In terms of Environmental Engineering programs all of our peer institutions have accredited BS degrees. None of these programs have accredited their graduate degrees. There are only four environmental engineering programs that are accredited at the MS level; however, none of these are peer institutions and none of these programs are accredited at the BS level. Therefore, accreditation will not be sought for the MS degree.

6. Projected Headcount and FTE Enrollment and Degrees Conferred (Table 2 provided in Full Proposal)

Appendix A

Curriculum and Requirements

- Admission Requirements

A description of Purdue University admission and registration requirements for graduate students is available in the Graduate Policies and Procedures Manual, Sections III and V respectively. That document is available online at:

http://www.purdue.edu/gradschool/faculty/documents/Graduate_School_Policies_and_Procedures_Manual.pdf

In addition to the general requirements for Purdue University, admission to graduate study in the Environmental and Ecological Engineering degree program is satisfactory completion of a baccalaureate degree at a college or university of recognized standing. Because of the diversity of topics within Environmental and Ecological Engineering, no one kind of undergraduate preparation is recommended. However, if deficiencies in math, chemistry, physics, or specific environmental engineering or science topics are identified by the graduate committee or advisor, they may be required to be completed during the first one or two semesters of a student's plan of study.

Before a candidate will be considered for admission, an application package for admission must be completed and received by the Environmental and Ecological Engineering graduate program office. In addition to the application form a number of supplementary documents must be submitted.

Applicants must submit a Statement of Purpose essay of approximately 300-500 words stating clearly and succinctly the reason for seeking graduate study in Environmental and Ecological Engineering at Purdue University, the applicant's career goals, and research interests. The applicant may include information about any unique circumstances, special abilities, awards, achievements, scholarly publications, or professional history that are relevant to the admission decision.

Letters of recommendation from three people who are knowledgeable about the applicant's academic, professional and scholarly ability and potential must be submitted. Applicants should not request letters from individuals who would have an objective conflict of interest (e.g. friends and family). Additional recommendations may be requested.

Official original transcripts from each college or university at which the applicant has completed course work must be on file before an application can be processed.

English Proficiency Requirements - At the time of enrollment, the records of all incoming on-campus graduate students are reviewed to determine whether or not they have met the minimum written English proficiency requirements as established by Environmental and Ecological Engineering. The minimum requirements are as follows:

International Students – A minimum score of 575 on the Test of English as a Foreign Language (TOEFL-paper) or minimum Internet-based test scores of Writing 18, Speaking 18, Listening 14, Reading 19, and a Total of 90. International English Testing System (IELTS) Academic Scores are also acceptable (6.5) as is Pearson Test of English (PTE) Academic scores (60).

Upon successful completion of the MS degree, a student may wish to continue towards a Ph.D. degree within Environmental and Ecological Engineering at Purdue University. A formal request must be filed in the Environmental and Ecological Engineering Graduate Program Office prior to the completion of the MS candidate semester. Continuation into the Ph.D. degree program is not automatic and the request will be evaluated by the Graduate Committee with input from the PhD advisor.

Prospective students from another college or university of recognized standing seeking to enter the Ph.D. degree program in Environmental and Ecological Engineering directly must have completed a Master's degree or equivalent coursework in an appropriate discipline.

Unconditional vs. conditionally admitted students

Applicants who have satisfactorily completed a baccalaureate degree in an appropriate discipline at a college or university of recognized standing and whose professional experience and/or academic preparation provides evidence that their preparation to commence graduate studies is excellent will be admitted unconditionally. Otherwise qualified applicants with deficiencies that could be remedied by specific coursework may be admitted conditionally with a requirement to complete specified coursework within a prescribed time, usually during the first two semesters.

The Graduate School will accept students conditionally if the applicant has not earned the equivalent of a 3.0/4.0 grade point average or higher at the institution from which he/she most recently graduated. In addition, the Graduate School may place a condition on the amount of prior coursework available for use on a graduate plan of study. Also, the Graduate School may place a condition on an applicant's admission if a required supporting document is missing. Specific requirements for removing a condition will be provided in the admission letter.

• **Curriculum Requirements**

The proposed Master of Science in Environmental and Ecological Engineering plan of study has a minimum requirement of 30 semester credit hours. Every student's plan of study will ultimately be guided by an advisory committee chaired by their major professor. All undergraduate students entering the proposed graduate program are expected to have baccalaureate level of competency in appropriate STEM areas. Students in the non-thesis Master's degree program must complete a minimum of 30 credit hours of course work. Students in the thesis Master's degree program must complete 9 credit hours of directed research and a minimum of 21 hours of course work to total to 30 hours. An integrated 4 + 1 BSEEE/MSEEE degree that can be completed in two semesters beyond the baccalaureate program will be offered. Students will carry forward 9 credits of approved course work from

their undergraduate program and then must complete 21 credit hours in the graduate program to earn their MSEE.

Ph.D. students must complete a total of 90 hours of which up to 30 credit hours may be carried forward from the Purdue University Master's degree or transferred from another University. Of the remaining 60 credit hours 42 credit hours of directed Ph.D. research must be completed with the remainder comprised of course work.

- Sample Curriculum

Non-Thesis MSEE Example Plan of Study – 30 Credit Hours Required - Time to Completion is Three Semesters.

Fall - Semester 1

Course No.	Cr	Course Title	Total Cr
CE 55000	3	Physico/Chemical Processes of Environmental Engineering	
CE 55700	3	Air Quality Management	
ASM 54000	3	Geographic Information System Application	
AGEC 52500	3	Environmental Policy Analysis	
			12

Spring - Semester 2

CE 55900	3	Water Quality Modeling	
CE 59700	3	Water Chemistry for Environmental and Ecological Engineers	
AGRY 54400	3	Environmental Organic Chemistry	
			9

Fall - Semester 3

EAPS 58400	3	Hydrogeology	
ME 59700	3	Sustainable Design and Manufacturing	
BIOL 58500	3	Ecology	9
			<hr/> 30

Thesis MSEEE Example Plan of Study - 30 Credit Hours Required - Time to Completion is Three Semesters.

Fall - Semester 1

Course No.	Cr	Course Title	Total Cr
CE 55000	3	Physico/Chemical Processes of Environmental Engineering	
CE 55700	3	Air Quality Management	
CE 54200	3	Hydrology	
			9

Spring - Semester 2

Course No.	Cr	Course Title	Total Cr
CE 55900	3	Water Quality Modeling	
AGRY 54400	3	Environmental Organic Chemistry	
EEE 69800	6	Thesis Research	
			12

Fall - Semester 3

Course No.	Cr	Course Title	Total Cr
ME 59700	3	Sustainable Design and Manufacturing	
BIOL 58500	3	Ecology	
EEE 69800	3	Thesis Research	
			9
<hr/>			30

Ph.D. Example Plan of Study (post-Master's) - 90 Credit Hours Required. Up to 30 credit hours from a Master's degree from a qualified institution may be applied toward the Ph.D. - Time to Completion is Six Semesters and one summer session.

Fall - Semester 1

Course No.	Cr	Course Title	Total Cr
AGRY 56000	3	Soil Physics	
FNR 57200	2	Community Involvement in Natural Resource Management	
GRAD 61200	1	Responsible Conduct of Research	
EEE 69900	3	Thesis Research	
			9

Spring - Semester 2

Course No.	Cr	Course Title	Total Cr
STAT 51400	3	Design of Experiments	
CE 59300	3	Environmental Geotechnology	
EEE 69900	3	Thesis Research	
			9

Fall - Semester 3

Course No.	Cr	Course Title	Total Cr
POL 52300	3	Environmental Politics and Public Policy	
HSCI 56000	3	Toxicology	
EEE 69900	3	Thesis Research	
			9

Spring - Semester 4

Course No.	Cr	Course Title	Total Cr
EEE 69900	9	Thesis Research	
			9

Summer Session

Course No.	Cr	Course Title	Total Cr
EEE 69900	6	Thesis Research	
			6

Fall - Semester 5

Course No.	Cr	Course Title	Total Cr
EEE 69900	9	Thesis Research	
			9

Spring - Semester 6

Course No.	Cr	Course Title	Total Cr
EEE 69900	9	Thesis Research	
			9
			<hr/>
			60

- Existing courses in the proposed curriculum

Following is a list of courses that have been offered one or more times since Fall 2012. These courses are highly appropriate for graduate study in Environmental and Ecological Engineering.

ABE 52700: Computer Models in Environmental and Natural Resources
ABE 53100: Instrumentation and Data Acquisition
ABE 58000: Process Engineering of Renewal Resources

AGEC 52500: Environmental Policy Analysis

AGRY 53600: Environmental Biophysics
AGRY 54000: Soil Chemistry
AGRY 54400: Environmental Organic Chemistry
AGRY 54500: Remote Sensing of Land Resources
AGRY 56000: Soil Physics
AGRY 58000: Soil Microbiology
AGRY 58200: Environmental Fate of Pesticides
AGRY 58500: Soils and Land Use

ASM 54000: Geographic Information System Application

BIOL 52900: Bacterial Physiology
BIOL 54900: Microbial Ecology
BIOL 58500: Ecology

CE 51500: Building Energy Audits
CE 54000: Open Channel Hydraulics
CE 54200: Hydrology
CE 54500: Sediment Transport Engineering
CE 54700: Transport Processes in Surface Waters
CE 54900: Computational Watershed Hydrology
CE 55000: Physico/Chemical Processes of Environmental Engineering
CE 55700: Air Quality Management
CE 55900: Water Quality Modeling
CE 59300: Environmental Geotechnology
CE 59700: Water Chemistry for Environmental and Ecological Engineers

CHM 58100/EAPS 52100: Atmospheric chemistry

EAPS 58300: Geology of Landfills
EAPS 58400: Hydrogeology

EDCI 50600: Environmental Education

GRAD 59000: ESE Coll/Seminar I (1 cr)
GRAD 59000: ESE Coll/Seminar II (1 cr)
GRAD 61200: Responsible Conduct of Research (1 cr)

FNR 52700: Ecotoxicology (2 cr) FNR
54300: Conservation Biology I
FNR 55800: Digital Remote Sensing and GIS
FNR 57200: Community Involvement in Natural Resource Management (2 cr)
FNR 57300: Community Involvement Practicum (1 cr)

HSCI 51400: Radiation Instrumentation Laboratory
HSCI 52600: Principles of Health Physics and Dosimetry
HSCI 53400: Applied Health Physics
HSCI 54000: Radiation Biology
HSCI 54500: Advanced Topics in Exposure Assessment
HSCI 54600: Advanced Industrial Hygiene Control Technology
HSCI 54700: Environmental Epidemiology
HSCI 56000: Toxicology
HSCT 57500: Introduction to Environmental Health
HSCI 58000: Occupational Safety and Ergonomics

IE 54500: Engineering Economic Analysis

ME 51400: Fundamentals of Wind Engineering
ME 52200: Indoor Environment Analysis and Design
ME 59700: Sustainable Design and Manufacturing

PHIL 55100: Philosophy of the Natural Sciences

POL 52300: Environmental Politics and Public Policy

STAT 50100: Experimental Statistics I
STAT 51100: Statistical Methods
STAT 51200: Applied Regression Analysis
STAT 51300: Statistical Quality Control
STAT 51400: Design of Experiments

Courses to be added

Four new faculty will be joining Environmental and Ecological Engineering in the 2014-15 Academic Year. Each of these faculty will develop one new graduate course that will complement the list of courses already available (i.e. there will not be duplication). Moreover, it is anticipated that as part of the College of Engineering Strategic Growth Initiative, 1 – 3 new faculty will be hired every year for next two to four years, with each hire designing and offering a new graduate course. In addition, it is likely that several existing courses will become cross-listed with EEE as part of the shared responsibility and collaboration model that follows from the joint appointments of the faculty. Courses

that are candidates for cross-listing are CE 55000: Physico/Chemical Processes of Environmental Engineering, CE 55900: Water Quality Modeling, CE 59700: Water Chemistry for Environmental and Ecological Engineers, and ME 59700: Sustainable Design and Manufacturing.

There are no courses that must be developed before a high quality degree program could be launched.

APPENDIX B

Program Faculty and Administrators (To be included in the full proposal)

APPENDIX C Letters of Support

October 21, 2014

John W. Sutherland, PhD
Professor and Fehsenfeld Family Head
Environmental and Ecological Engineering
Purdue University
West Lafayette, IN 47907



RE: Purdue University
Environmental and Ecological Engineering
Graduate Degree Program

Dear Professor Sutherland:

I am a business owner, holder of an M.S. degree in engineering from Purdue, and have served as a professional environmental engineer with 20 years of experience in environmental consulting. In my role, I assess the quality and capabilities of new graduates that come into our business. This assessment is made in light of my professional preparation, personal experience, and industry demands. Establishment of Purdue's EEE UG degree several years ago has produced young engineers with a diverse educational background in air, water, waste, and sustainability. This well positions them to acquire a broad set of environmentally-related skills as they enter the workforce. The proposed EEE graduate program will increase the depth of knowledge and value of matriculating students and open additional areas in which they can work to address complex environmental remediation problems.

At Shrewsberry, our environmental practice is divided into three areas. These groups are assessment, compliance, and remediation. Individuals with EEE undergraduate degrees are essential to our environmental services business, but MS and PhD students with a greater depth of knowledge in specific subject matter will make a more immediate and meaningful contribution in seeking solutions and creating designs for the purpose of the remediation of solid, liquid, or gaseous phase contamination. Because of this, we strongly support the establishment of a graduate degree program in EEE that offers MS and PhD degrees. This will afford our future employees the opportunity to conduct detailed research and gain more experience and knowledge in specific environmental engineering areas. Recent data shows an increase in the number of individuals who are seeking advanced degrees in environmental engineering. Attainment of an advanced degree provides more opportunities for greater responsibility in the workplace and better compensation. Establishing a graduate degree program within EEE will increase the depth of knowledge of students making them more marketable and produce rigorously prepared environmental engineering students with appropriate breadth and depth of knowledge.

As the Chair of the External Advisory Council (EAC) for EEE, I would like to comment briefly on the resources that EEE has to launch a successful graduate program. I have personal knowledge of the space plans of the College of Engineering (CoE). I recently met with the CoE administration and was assured that, as the EEE program grows (undergraduate and graduate); space and faculty positions will be made available to accommodate this growth. Dean Leah Jamieson of the CoE is a strong supporter of EEE and will continue to supply required resources.

Sincerely,

SHREWSBERRY & ASSOCIATES, LLC



Kenneth Beache, P.E., BCEE
VP/COO



John W. Sutherland, PhD
Professor and Fehsenfeld Family Head
Environmental and Ecological Engineering
Purdue University
West Lafayette, IN 47907

November 7, 2014

RE: Letter of Support
Environmental and Ecological Engineering Graduate Program

Dear Dr. Sutherland,

Please accept this as a letter of support for the University's efforts to create a graduate engineering program in Environmental and Ecological Engineering.

CHA is a full service ENR Top 500 (2014 Rank =57) engineering company with approximately 1,200 staff located in more than 45 domestic and international offices (www.chacompanies.com). We currently have over 200 staff located in Indiana with offices in Evansville, South Bend, and Indianapolis. In Indiana we are a major service provider for governmental agencies like Citizens Energy Group, the City of Indianapolis, the City of South Bend, the Indiana Department of Transportation, and the Indianapolis Airport Authority. We are also a major service provider to industry with clients that include many Fortune 500 companies like Pepsi, General Mills, and GE.

CHA operates with a market-oriented structure that is client centered. Our core markets include:

- Campus & Institutional
- Aviation
- Transportation
- Environmental
- Development Solutions
- Manufacturing and Energy
- Utilities
- Sports
- Geosolutions
- Construction

Our technical staff are organized internally by discipline to foster the development of technical skills in areas that are necessary for the markets we serve . Overall, our organization is structured to provide responsive client-specific services, effective and efficient project management, and superior technical performance. Our internal technical groups are managed by experts in their disciplines and they include:

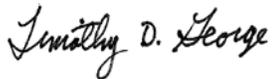
- Civil
- Structural
- Mechanical
- Electrical
- Landscape Architecture
- Sports Architecture
- Environmental
- Geotechnical
- Survey
- Planning

Technical competency is an essential ingredient for success with the clients we serve and this is especially true in our environmental market where we provide planning, design and construction support for a wide array of environmental engineering projects ranging from environmental permitting and modeling to the design of constructed wetlands, landfills, and large scale water and wastewater treatment facilities. As a consequence, a large percentage of the staff in our environmental technical groups hold advanced degrees in engineering and our recruitment process favors candidates with advanced degrees. In today's business environment specialization is important and our own internal programs, like our Technical Leaders Program, encourage and support specialization and specialty certification.

Your new graduate program in Environmental and Ecological Engineering would fulfill a need for CHA by providing a pool of highly qualified graduates from which we could draw to fill our current and projected needs for entry level environmental engineering staff in Indiana and across the United States. Your new program would also position your graduates favorably when compared to graduates that we regularly recruit and hire from the graduate programs in Environmental Engineering from Virginia Tech, the University of South Florida, Clarkson, and the University of Massachusetts.

We wish you the best of luck and success in the development of your new graduate programs.

Very truly yours,

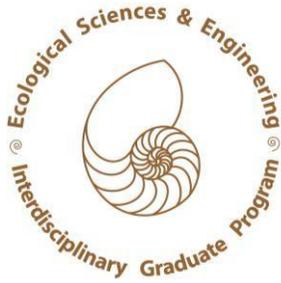


Timothy George, Vice President
Market Segment Leader - Environmental



Shawn Veltman, Ph.D, P.E., BCEE
Technical Services Manager – Water & Wastewater

cc Meg Whelton, P.E



November 10, 2014

TO: John W. Sutherland, Fehsenfeld Family Head
Environmental and Ecological Engineering (EEE)
Purdue University
jwsuther@purdue.edu

RE: Support of an EEE Graduate Degree

I am pleased to write a letter of support for establishing a graduate degree program in Environmental and Ecological Engineering (EEE). Over more than the past decade there has been a growing need for a program like EEE on the Purdue campus and even more so, a graduate faculty base and associate graduate program in support of the engineering research needed in this field. Because of EEE, Purdue has been able to finally successfully recruit faculty in areas associated with environment, resilience, and sustainability that have been severely lacking. Subsequently, we finally have a place to put the numerous graduate students that would like to attend Purdue but have not had a satisfactory research group in which to be placed, thus choosing to go other universities. There has been at least a dozen students each year applying to the Ecological Science & Engineering Interdisciplinary Graduate Program (ESE IGP aka IESE) for which I serve as Head that I could not successfully recruit because of faculty not doing research in areas of interest now covered by EEE and associated academic units that have benefited from EEE hires. A number of our existing IESE students over the past 5 years have had difficulty finding an appropriate academic home in the College of Engineering, because although they were able to find a faculty member doing research of interest to them, those faculty members' departments was not their academic department of choice in that the courses required by that academic unit did not align well with their research or future career goals. Having a graduate degree program in EEE will meet the needs of these students and help faculty to recruit the types of students they want to meet their research goals.

For clarification, since I hear inaccurate comments, unnecessary confusion arises frequently, EEE is not in competition with the IESE, but rather a much needed academic partner. IESE currently umbrellas 15 degree-granting departments across 5 colleges (College of Agriculture, College of Engineering, College of Liberal Arts, College of Science, and College of Technology); therefore, while EEE facilitates bridges across engineering disciplines, the IESE fosters critical thinking across disciplines represented by 5 colleges. Specifically, the IESE creates an environment that allows students to learn other discipline 'languages' and cultures including becoming

aware of their own dogmas, and biases, thus allowing them to experience issues and fundamental knowledge through multiple lenses and enhances their learning experience. The IESE would benefit from a EEE graduate degree and current faculty associated with EEE have already benefited from and are active in the IESE, thus a very symbiotic relationship already exists and would continue to grow. EEE will enhance the IESE's ability to recruit excellent graduate students from the engineering fields, which has decreased over the past few years due to a lack of appropriate research group placement opportunities for these students (as noted earlier) and the IESE will continue to enhance EEE faculty's ability to recruit graduate students with a desire for an interdisciplinary and holistic perspective, which better fits many of the problems they are trying to address in their research.

I have no doubt that establishing a graduate program within EEE will benefit the entire Purdue campus. With great anticipation I whole heartedly look forward to having an IESE-EEE partnership established as soon as the EEE graduate program is approved.

Sincerely,



Linda S. Lee

(765) 494-8612; lslee@purdue.edu

Department of Agronomy, Professor of Environmental Chemistry, Associate Head
Ecological Science & Engineering Interdisciplinary Graduate Program, Program Head
Environmental and Ecological Engineering, Affiliate



Pedro J. Alvarez, Ph.D., P.E., DEE

Professor and George R. Brown Chair of
Civil and Environmental Engineering.
Rice University – MS 519
Houston, TX 77251-1892
P: 713.348-5903 F: 713.348-5268
Email: alvarez@rice.edu

15 October 2014

John W. Sutherland, Ph.D.
Professor and Fehsenfeld Family Head
Environmental and Ecological Engineering Potter Engineering Center, Room 364
500 Central Drive
Purdue University
West Lafayette, IN 47907

Dear Professor Sutherland:

Considering the growing need for more graduate-level programs in environmental engineering, I enthusiastically endorse the development of the Environmental and Ecological Engineering graduate program at Purdue University. I am the George R. Brown Professor and Chair of the Department of Civil and Environmental Engineering at Rice University, a past President of the Association of Environmental Engineering and Science Professors and a licensed Professional Engineer in three States. I have been working as an Environmental Engineer in practice or in academia for 30 years.

Employment in environmental engineering is expanding faster than in most fields of engineering. The pipeline of graduates from Environmental Engineering baccalaureate programs in the U.S. meets only about one-half of the workforce needs. Almost half of the professionals working in Environmental Engineering come from other disciplines. It is essential that these individuals have more opportunities to acquire the education and credentials necessary to enter the workforce. Moreover, the educational attainment of Environmental Engineers is rising with more than 40% of practicing professionals earning graduate degrees.

Environmental Engineering is a relatively young and very dynamic field that is evolving constantly. The Environmental and Ecological Engineering program at Purdue University is noteworthy with its vision to manage emerging complex problems with a systems perspective that considers conventional environmental engineering approaches integrated with ecological interactions. Sustainability, industrial ecology and resilient design are at the forefront of modern Environmental Engineering practice and your program will have a strong foundation with these guiding principles. More environmental engineers with advanced degrees will have a positive impact on society by improving the quality of life and the quality of the environment in which we live. I strongly support the development of Master's and PhD degrees in Environmental and Ecological Engineering at Purdue University without reservations. If I can be of assistance with this endeavor please do contact me.

Sincerely

Pedro J. Alvarez, Ph.D., P.E., DEE
George R. Brown Professor and Chair of Civil and Environmental Engineering



October 16, 2014

Dr. John Sutherland
Environmental and Ecological Engineering
Purdue University
West Lafayette, IN 47907

Dear John:

I strongly support the application by the Division of Environmental and Ecological Engineering (EEE) to develop graduate degree (MS and PhD) programs. I believe these are long overdue. I graduated from Purdue with an M.S. degree in 1970 and a Ph.D. in 1972. While all of my work was in environmental engineering, the degrees were designated as civil engineering degrees. My education at Purdue was excellent and allowed me to go on to a very successful career. In addition to being a professor at four universities, a department head at two universities, an Associate Dean of research at two universities and an Associate Vice President of Research, I spent four years at the National Science Foundation as the Environmental Engineering Program Director, am a Fellow of for international organizations, and have served on the boards of many organizations, including the Water Environment Research Foundation, the International Water Association, the American Academy of Environmental Engineers and ABET. Thus, I feel very qualified to judge the needs of the profession and the quality of academic programs.

As a member of the Purdue EEE advisory committee, I have been able to examine in detail the structure and performance of the EEE program. I have found it to be a very high quality program, even though they have been in existence for only a short time. The faculty are excellent, as is the quality of the research. They certainly have the resources to offer outstanding M.S. and PhD degree programs.

There is a great need for more environmental engineering graduates at both the M.S. and PhD levels. The demand for new environmental engineers is not currently being met by graduates from American universities, particularly by American students. The need for new graduate programs is great.

As a former ABET director, I have seen just about every quality environmental engineering program in the U.S. and most international ones. I believe that Purdue has the ability to join this select group of institutions. Creating these new programs will be a great aid to this.

Purdue has always been a world leader in the environmental engineering arena, dating back many decades with Purdue Industrial Waste Conferences, the former leader in environmental engineering conferences. It is time to restore the distinction of Purdue as being at the forefront of improving the world's environmental quality by creating graduate degrees in environmental engineering.

Sincerely,

A handwritten signature in blue ink that reads "Paul L. Bishop". The signature is written in a cursive style with a large initial 'P'.

Paul L. Bishop
Associate Dean of Engineering for Research
University of Rhode Island
Professor Emeritus of Environmental Engineering
University of Cincinnati

