COVER PAGE

INSTITUTION: Indiana State University

COLLEGE: College of Technology

DEPARTMENT: Applied Engineering and Technology Management

DEGREE PROGRAM TITLE: Bachelor of Science in Civil Engineering Technology

FORM OF RECOGNITION TO BE AWARDED/DEGREE CODE: Bachelor of Science

SUGGESTED CIP Code: 15.0201

LOCATION OF PROGRAM/CAMPUS CODE: Terre Haute, IN/ 00180700

PROJECTED DATE OF IMPLEMENTATION: Spring Semester 2012

DATE PROPOSAL WAS APPROVED BY INSTITUTIONAL BOARD OF TRUSTEES: May 06, 2011

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SIGNATURE OF AUTHORIZING INSTITUTIONAL OFFICER

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DATE

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DATE RECEIVED BY COMMISSION FOR HIGHER EDUCATION

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COMMISSION ACTION (DATE)

A. Abstract

Bachelor of Science in Civil Engineering Technology
Indiana State University, Terre Haute, Indiana
Offered as a traditional campus based program

Objectives:

The Bachelor of Science (B.S.) in Civil Engineering Technology (CVET) will prepare graduates with the technical and managerial skills necessary to enter careers in the planning, design, construction, operation, or maintenance of the built environment and global infrastructure. The graduates will be able to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of civil engineering projects.

Clientele to be served:

The program is intended to serve undergraduate students who may enroll on either a full-time or part-time basis. While the main goal is to fill the seats in the program with qualified Indiana residents, out-of-state and international students will also be welcome, regardless of age, gender, or ethnicity/cultural background. Students who may be attracted to the program include:

- High school graduates who want to pursue a career in the area of civil engineering,
- Two-year community college graduates,
- Current technology students pursuing a construction management degree at ISU,
- Students currently enrolled in other programs or those undecided about majors, who desire or may desire a career in the area of civil engineering technology,
- Individuals currently employed in related positions who desire to further their education.

Curriculum:

The curriculum is designed to satisfy the criteria published by the Accreditation Board of Engineering and Technology - TechnologyAccreditation Commission (ABET-TAC). Since the existing mechanical engineering technology undergraduate program is accredited by ABET-TAC, effort has been made to formulate a flexible structure to allow the development of a shared core for both the mechanical engineering technology and civil engineering technology programs to create synergies and consolidate resources between the two programs. The proposed Civil Engineering Technology Program will require a minimum of 127 credits that can be completed in eight semesters. Course content includes technical requirements, technical and management electives, mathematics and science, and foundational studies. Experiential learning will be emphasized through laboratories, cooperative practice, internship, and other community/industry engagements.

Employment opportunities:

In the increasingly interconnected and global society of the 21st century, the world's built infrastructures is being subjected to greater pressures than in the past. Population increases,

economic growth, environmental concerns, and new technologies present unprecedented challenges for finding new and creative solutions that preserve, enhance, and construct society's built environment.

Broadly addressing society's future infrastructure, The Vision for Civil Engineering in 2025, based on the summit on the Future of Civil Engineering – 2025 that was held in June 2006 states:

> "shifting demographics and population growth continue to strain the overburdened infrastructure ... In the developed world, infrastructure is aging and maintenance or replacement has not kept pace with deterioration. In the developing world, the need for new infrastructure outstrips society's ability to put it in place. Influenced by civil engineering leadership, people now better understand the crucial link between infrastructure and quality of life, which has caused a major public policy shift in favor of improved infrastructure maintenance and accelerated infrastructure growth." [1]

A recent national estimate developed by a partnership of the American Society of Civil Engineers [2], U.S. Conference of Mayors [3] and the American Public Works Association [4] valued the backlog of United States infrastructure needs at $1.6 trillion. Looking ahead, the increasing global population and its shift towards urban areas will require expanding demands for even the most basic infrastructure development where civil engineers alone currently represent 46% of the national engineering employment of all engineering specialties employed in these types of architectural, engineering, and related services. According to the U.S. Department of Labor's Bureau of Labor Statistics, civil engineers are expected to see national employment growth up to 17% through 2014 due in part:

> "to the increased emphasis on infrastructure security where more civil engineers will be needed to design and construct safe and higher capacity transportation, water supply, and pollution control systems, as well as large buildings and building complexes." [5]

Fields which traditionally employ civil engineers are projected to grow through 2014 including, for example, professional, scientific, and technical services (28.4%); water, sewage and other related utilities (21%); and trade, transportation, and other related utilities (10.3%) [2].

Societal infrastructure problems are complex and opportunities for successful solutions will be greatest where diverse fields of study intersect leading to new technologies. The Association of American Colleges reports:

> "So many technical problems are now also social problems – or ethical, or political, or international problems – that some ability to deal with them as such is just part of the essential professional equipment of engineers."

There is an increasing demand for civil engineers trained to develop solutions for infrastructure problems in a climate of growth with significant environmental pressures. Unlike the past, the

ability to design new products, processes, and systems for modern industries that prevent, rather than control, environmental problems will be in high demand.

The overall justification for graduates of an undergraduate civil engineering program is the need for engineers prepared to deal with the increasingly complex dynamics between society's infrastructure and its environment, and the need for local solutions that integrate with state and regional growth management plans.

Graduates of the program will have excellent professional career opportunities due to the large current and projected demand for civil engineers. According to the Indiana Department of Workforce Employment [9], the demand for civil and environmental engineers in the State of Indiana will increase by 14.33% and 28.26%, respectively for the period 2000–2010. This implies 120 out of 690 annual engineering job openings in Indiana will be in the areas of civil and environmental engineering. The Bureau of Labor Statistics projected that 19.44% of the total 432,000 engineering job openings during the same period will be in the same areas, second highest among all engineering disciplines after mechanical engineering (21.76%).

Graduates will be able to seek employment in a wide range of civil engineering specialties including bridge and highway design, construction management, geotechnical engineering, hydraulic systems design, land development, pollution control, and structural design. Employment opportunities will exist with private consulting firms, design/construction businesses, and government agencies, including the Indiana Department of Transportation (DOT), Department of Environmental Protection, U.S. Geological Survey, U.S. Army Corps of Engineers, and the uniformed services. Local municipality planning and engineering agencies will also offer opportunities for employment. People seeking self-employment opportunities will be aided by education leading to licensure as a professional engineer. In the U.S. Bureau of Labor Statistics' list of popular engineering technology majors, civil engineering was ranked number two in 2008 and number one in 2009. It was also ranked as the most demanding engineering professionals by industries for 2008–2009 (about 30% in 2009).

B. Program Description

1. Proposed Program and Its Objectives:

Program mission

The mission of the Bachelor of Science in Civil Engineering Technology Program at Indiana State University (ISU) will prepare graduates with the technical and managerial skills necessary to enter careers in the planning, design, construction, operation, or maintenance of the built environment and global infrastructure. Preparing students will involve the highest standards of pedagogy, inclusive of hands-on laboratory experiences, experiential learning, and community engagement. Graduates will be able to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of civil engineering projects.

Program objectives

The program will prepare graduates with the technical and managerial skills necessary to enter careers in the planning, design, construction, operation, or maintenance of the built environment

and global infrastructure. Graduates will be able to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of civil projects.

Program outcomes

As described in the ABET-TAC criteria for accrediting the B.S. in Civil Engineering Technology Program by the time of graduation Indiana State University students will be able to:

a. utilize graphic techniques to produce engineering documents;
b. conduct standardized field and laboratory testing on civil engineering materials;
c. utilize modern surveying methods for land measurement and/or construction layout;
d. determine forces and stresses in elementary structural systems;
e. estimate material quantities for technical projects;
f. employ productivity software to solve technical problems;
g. plan and prepare design and construction documents, such as specifications, contracts, change orders, engineering drawings, and construction schedules;
h. perform economic analyses and cost estimates related to design, construction, operations, and maintenance of systems in the civil technical specialties;
i. select appropriate engineering materials and practices;
j. apply basic technical concepts to the solution of civil problems involving hydraulics, hydrology, geotechnics, structures, material behavior, transportation systems, and water and wastewater systems; and
k. perform standard analysis and design in at least three of the recognized technical specialties within civil engineering technology that are appropriate to the goals of the program.

Outcome assessment:

The outcomes assessment for the B.S. in Civil Engineering Technology Program will mirror the outcomes assessment of other engineering technology programs. Each of these engineering technology programs, automotive, packaging, mechanical, electronic, and computer, has robust and functioning outcome assessment plans. Table 1 summarizes the outcomes of the program and the methods of evaluating those outcomes.

Table 1: B.S. in CVET - Matrix of Program Outcomes and Assessment Methods

	Follow-up Survey	Survey of Graduating Students	Analysis of Comprehensive Evaluations	Analysis of Culminating Experiences
a. an appropriate mastery of the knowledge, techniques, skills, and modern tools by the student who selected the civil engineering technology discipline.		X		
b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology.			X	
c. an ability to conduct, analyze, and interpret experiments, and apply experimental results to improve processes.	X		X	

	Follow-up Survey	Survey of Graduating Students	Analysis of Comprehensive Evaluations	Analysis of Culminating Experiences
d. an ability to apply creativity in the design of systems, components, or processes appropriate to the students who selected the civil engineering technology program educational objectives.	X		X	X
e. an ability to function effectively on teams.	X			X
f. an ability to identify, analyze, and solve technical (close-ended analysis and open-ended design) problems.			X	
g. an ability to communicate effectively through engineering drawings, written reports, or oral presentations.	X			
h. a recognition of the need for, and an ability to engage in, lifelong learning.		X		
i. an ability to understand professional, ethical, and social responsibilities.			X	
j. a respect for diversity and a knowledge of contemporary professional, societal, and global issues.	X			X
k. a commitment to quality, timeliness, and continuous improvement.	X			

2. Admission Requirements, Anticipated Student Clientele, and Student Financial Support

The B.S. in civil engineering technology will serve a variety of student populations. A population of students within the Ivy Tech community college system is currently enrolled in an engineering technology program and will be seeking an opportunity to continue their education via a four-year institution in a civil engineering technology program. Additionally, within this population, are students who will graduate with a two-year degree in one of Ivy Tech's technology offerings, but are undecided regarding a career choice and wish to continue their education in civil engineering technology courses at the four-year level, without incurring a significant transfer credit penalty. The B.S. in Civil Engineering Technology Program will articulate with its Ivy Tech counterpart with the objectives of minimizing credit loss and making the program more palatable to prospective transfers. It follows that the B.S. in civil engineering technology clients will include two-year transfer students, technology-oriented students seeking a program that offers a broad spectrum of courses, two-year institutions that offer engineering technology programs and need a four-year sister institution that offers coursework in civil engineering technology, and employers/industries that need civil engineering technologist with strong technical credentials and good critical thinking skills. Table 2 summarizes the anticipated B.S. in civil engineering technology clientele.

Table 2: Anticipated B.S. in CVET Clientele.

1.	Ivy Tech students who are currently enrolled in an engineering technology program and will be seeking the opportunity to continue their education via a four-year institution in CVET	Block articulation focus on completion of an accredited associate of science degree
2.	Ivy Tech students who are undecided regarding a career choice and wish to continue their education in civil engineering technology courses at the four-year level	
3.	Transfer students from two-year institutions that offer engineering technology programs and need a four-year sister institution that offers coursework in CVET	
4.	Freshmen who come to Indiana State University and are undecided about which engineering technology program is a good fit for their aptitudes and career aspirations	Per ISU/College of Technology policy
5.	Employers/industries that need civil engineering technologist with strong technical credentials and good critical thinking skills.	

3. Proposed Curriculum

a. The proposed curriculum for ISU's Bachelor of Science in CVET is listed in Table 3.

Table 3: Required Courses for B.S. in CVET (83 credits).*

Course prefix and number	Credit hours
Core Courses (54 credits)	
MET 103 - Introduction to Technical Graphics with CAD	3
MET 130 - Introduction to Engineering and Technology	2
MET 302 - Applied Statics	3
MET 304 - Engineering Analysis	3
MET 329 - Fluid Power Technology	3
MET 405 - Economic Analysis for Engineering and Technology	3
MET 406 - Strength of Materials	3
MET 409 - Senior Project in Industrial Technology	3
MET 430 - Senior Seminar	1
CVET 401 - CAD-Based Applications in civil engineering technology and Surveying	3
CVET 410 - Structural Analysis and Reinforced Concrete Design	3
CVET 420 - Highway Design	3
CVET 411 - Waste Water System Design	3
CNST 111 - Construction Materials, Methods, and Equipment	3
CNST 201 - Construction Contract Documents	3
CNST 320 - Soil Analysis and Testing	3
CNST 420 - Plane Surveying	3
ENVI 401 - Geographic Information Systems: Applications	3
ENVI 454 - Introduction to Hydrology	3
Electives from (9 credits)	
3-6 credit hours from:	
CNST 310 - Construction Safety	3
CNST 414 - Construction Quality Control and Assurance	3
MET 337 - Thermo Systems	3
MET 351 - Cooperative Industrial Practice	3
Other course(s) approved by the advsior	
3-6 credit hours from:	
TMGT 361 - Quality Systems and Tools	3
TMGT 421 - Research and Development in Technology	3

TMGT 429 - Workplace Law for the Technical Manager	3
INS 340 - Introduction to Risk and Insurance	3
Other course(s) approved by the advisor	
Science with Laboratory (8 credits)	
ENVI 170 and 170L - Earth Science/Laboratory	4
PHYS 105 and 105L - General physics/Laboratory	4
Mathematics (9 credits)	
MATH 115 - College Algebra or MET 215 - Graphic Analysis	3
MATH 123 - Analytic Geometry and Linear Algebra for Engineers	3
MATH 301 - Fundamental and Applications of Calculus	3
Computer (3 credits)	
One from:	
TMGT 195 - Introduction to Computer Applications	3
MET 299 - CAD Fundamentals	3
Or other course approved by the advisor	
TOTAL HOURS	83

* Include 11 credits of Foundational Studies (ENVI 170 and 170L and PHYS 105 and 105L; MATH 115 or MET 215).

b. The B.S. in CVET Program contains four new courses. Consistent with policies established by the College of Technology and Indiana State University, the program has been approved by the faculty committees of the College of Technology, the Dean of the College, Faculty Senate, Provost and Vice President of the University, and the Board of Trustees of Indiana State University.

c. All courses will be delivered by Indiana State University.

4. Form of Recognition

a. Students who satisfactorily complete the requirements for this program will be awarded a bachelor of science in civil engineering technology.

b. The suggested CIP code for the CVET program is 15.0201.

c. Bachelor of science in civil engineering technology, Indiana State University College of Technology, Terre Haute.

5. Program Faculty and Administrators

Table 4 displays the existing faculty and administrators most closely associated with the program. Upon approval of the proposal, the program will seek to hire one new tenure-track faculty and additional adjunct faculty as necessary.

Table 4: Faculty and Administrators of the Proposed B.S. in CVET.

Name	Degree	Rank	Specialization	Appointment
ADMINISTRATORS				
Bradford Sims	Ph.D.	Professor and Dean, College of Technology	Construction Management	Tenured
Robert English	Ed.D.	Professor and Associate Dean, College of Technology	Electronics Engineering Technology	Tenured
Kara Harris	Ed.D.	Assistant Professor and Assistant Dean in the area of Technology Education, College of Technology	Technology Education	Tenure-Track
FACULTY				
M. Affan Badar	Ph.D.	Associate Professor and Chair, Department of Applied Engineering and Technology Management	Mechanical Engineering Technology	Tenured
Ming Zhou	Ph.D.	Professor	Mechanical Engineering Technology	Tenured
A. Mehran Shahhosseini	Ph.D.	Assistant Professor	Mechanical Engineering Technology	Tenure-Track
Todd E. Alberts	M.S.	Instructor	Mechanical Engineering Technology	Full-time
Lee Ellingson	Ph.D.	Associate Professor	Construction Management	Tenured
Chul Kim	Ph.D.	Associate Professor	Construction Management	Tenure-Track
Donald McNabb	M.S.	Instructor	Construction Management	Full-time

6. Needed Learning Resources

Available learning resources include the Cunningham Memorial Library with an extensive collection and array of services that has provided exceptional service to ISU students for many years. The library is a federal government depository, receiving approximately 52% of the materials available from the GPO–Government Printing Office. A wide assortment of online journal and database subscriptions in the engineering technology related fields are already in place.

7. Other Program Strengths

a. Being situated in the College of Technology at Indiana State University gives this program a firm foundation in serving rural America. The college has a long tradition of preparing technologists to meet the changing technology needs of the Wabash Valley and beyond. Indiana State University is a leader in collaboration as evidenced by its active participation in engineering technology, and by the leadership offered by distinguished college faculty.

b. On-campus students and faculty benefit from College of Technology laboratories and equipment. Most off-campus students are employed full-time in industry; therefore, their real-world laboratories are even a greater advantage not just for them, but for faculty and on-campus students as well. Off-campus contacts (current students and others) lead to many cooperative endeavors, e.g., internships and employment opportunities for students, faculty sabbatical activities, and other research collaborations.

C. Program Rationale

1. Institutional Factors

a. Indiana State University is recognized for excellence in experiential learning and community engagement. The Higher Learning Commission's strategic planning document, *Reaching Higher*, has encouraged ISU to continue its' leadership in forming collaborations across public, business, and education sectors as well as providing professional programs. This program is consistent with both of these areas. By encouraging students to focus on civil engineering technology, this program will help meet critical needs in west-central Indiana, in the Midwest, and in numerous areas across the United States.

b. Indiana State University has the capacity to grow enrollment with the endorsement of the Indiana Commission on Higher Education, which has identified a goal of creating more careers in the state. Opening a CVET program in the Wabash Valley also fits the well documented need for more engineering technologists willing to serve in rural and underserved areas of our country.

2. Student Demand

Civil engineering technology programs have had high demands in most of the institutions in the United States, where such programs exist. For example, Figure 1 shows civil engineering technology programs demand for 16 years at the State University of New York, Institute of Technology, Utica/Rome, New York [9]. Similarly, Figure 2 shows a higher demand at Old Dominion University, Norfolk, Virginia [10].

Nationwide, the U.S. Department of Labor, Bureau of Statistics [5], reported that civil engineers held about 256,000 jobs in 2006 and projected an 18% (46,000 jobs) increase in employment of civil engineers for the period of 2006-2016. The availability of jobs, both locally and nationally,

and the higher than average starting salaries will continue to drive high student demand for this area of engineering practice.

Graduates of the proposed degree program will meet an important need in civil engineering services in this region. More importantly, the proposed degree program will provide yet another avenue for the growing number of Indiana students who are interested in the environmentally connected infrastructure to acquire an education that qualifies them for an increasingly meaningful career.

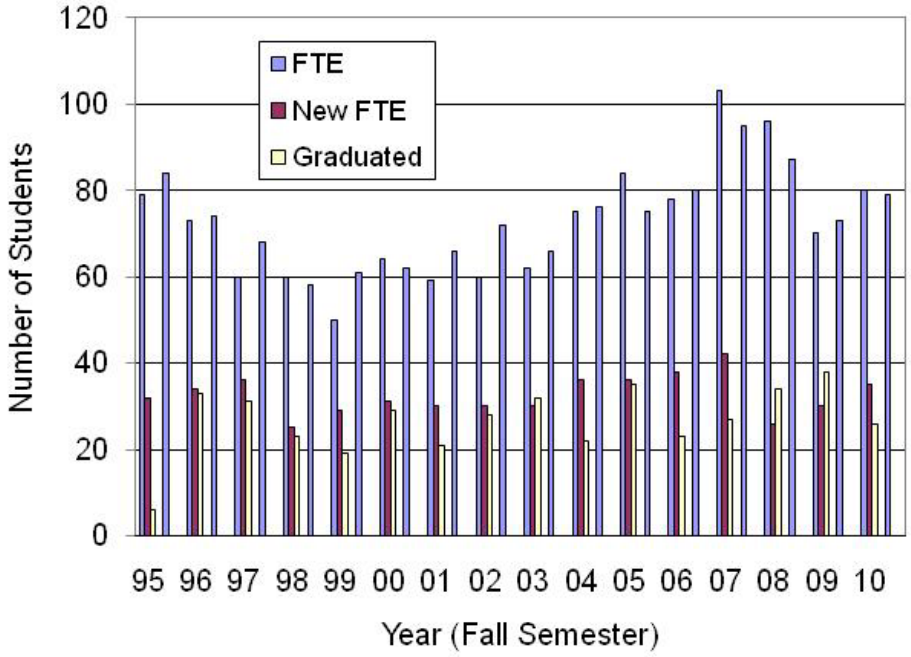

Figure 1: CVET programs demand at the State University of New York, Institute of Technology, Utica/Rome, New York. FTE stands for Full-Time Equivalent student.

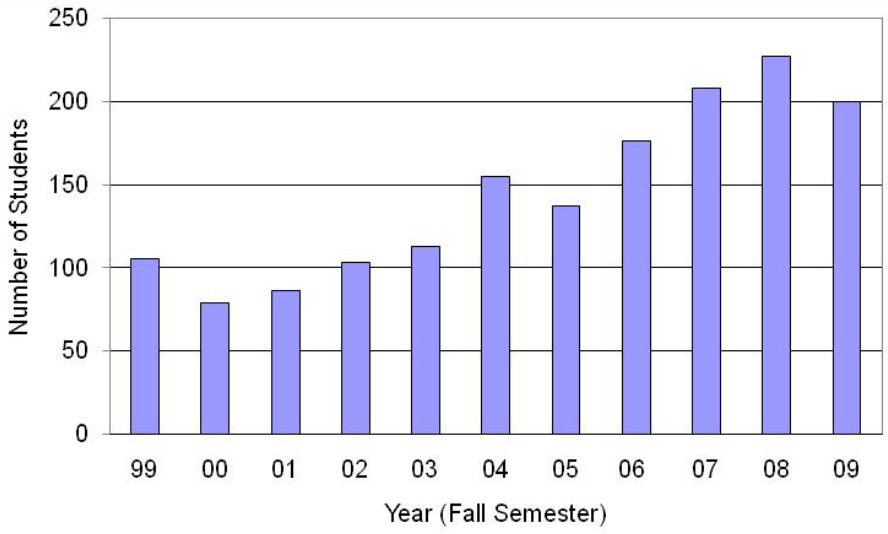

Figure 2: CVET programs demand at Old Dominion University, Norfolk, Virginia.

3. Access to Graduate and Professional Programs

Students may opt to enter graduate programs in technology management, construction management, etc. offered at Indiana State University and other universities.

4. Demand and Employment Factors

a. Geographic Region to be Served. After successful completion of the national certifying examination ISU graduates will be qualified to seek state licensure as professional engineers throughout the United States. The program's intention is to attract and train persons desiring to serve in rural and underserved segments of the population. The hope is that a good number of the program's graduates will stay in central Indiana.

b. Review of Literature. For most of the past 20 years, the United States has not produced enough engineering graduates to meet employment demands. The Engineering Workforce Commission [11] found a 19.8 percent decrease in the number of engineering degrees awarded between 1986 and 1998. During the same period, the total number of degrees awarded in the United States increased by 20 percent. To date, the shortfall has been made-up by favorable immigration policies towards immigrants with engineering backgrounds.

Similarly, the historic shortfall of engineers within the State of Indiana is projected to continue, as the overall number of engineering graduates decreases, and the aging engineering workforce continues to retire at a faster rate than can be replaced. According to the U.S. Department of Labor [5], during the 2008–2018 decade, overall engineering employment is expected to grow by 24.3 % (See Table 5). Employment of civil engineers is expected to rise almost as quickly as the average for all occupations as a result of the aging infrastructure.

Table 5: Overall Civil Engineering Employment.

Occupation	Employment (in thousands)		Employment Change 2008-2018		Job openings 2008-2018 (in thousands)
	2008	2018	Number (in thousands)	Percent	
Civil Engineers	278.4	345.9	67.6	24.3	114.6

News media continually report that the nation's infrastructure–highways, ports, roads, bridges, dams, airports, public buildings, mass transit, railroads, and water management– is in need of extensive repair and modernization. Furthermore, many other countries are expected to expand infrastructure construction. Employment projections compiled by the Bureau of Labor Statistics and the Indiana Workforce Development Office [8] highlight the projected large demand for professionals in civil and environmental engineering, not only in Indiana but also statewide and nationwide. In the State of Indiana, among 690 annual average engineering job openings, 120 jobs are in the fields of civil and environmental engineering, which is the second highest after mechanical

engineering. Furthermore, in the areas of northeastern Indiana, civil and environmental engineering is one of few engineering disciplines with positive growth rates in terms of new job openings. Taking account of crossover professionals such as architects and surveyors, the demand for civil engineers will be even higher.

The projections for the architecture and engineering occupations in the State of Indiana, compiled by the Indiana Department of Workforce Development Office [8], are listed in Table 6:

Table 6: Architecture and Engineering Occupations in Indiana (2008–2018).

Occupation	Number of Jobs		Employment Increase 2008-2018 (%)	Job openings 2008-2018
	2008	2018		
Civil Engineers	3,232	3,964	22.6	1,278
Environmental Engineers	587	780	32.9	315
Mechanical Engineers	7,769	8,056	3.7	2,282
Industrial Engineers	6,453	7,265	12.6	2,460
Civil Engineering Technicians	710	851	19.9	275
Architectural and Civil Drafters	1,922	2,073	7.9	564
Surveyors	1,136	1,297	14.2	451

c. Potential Employers. Graduates may seek employment in a wide range of civil engineering specialties including bridge and highway design, construction management, geotechnical engineering, hydraulic systems design, land development, pollution control, and structural design. Employment opportunities will also exist with private consulting firms, design/construction businesses, and government agencies such as the Indiana Department of Transportation, Department of Environmental Protection, U.S. Geological Survey, the U.S. Army Corps of Engineers, and the uniformed services. Additionally, graduates may pass the Fundamentals of Engineering Engineer-in-Training Examination– the first step in receiving licensure as a professional engineer.

d. Independent Needs Analysis. The demand for civil engineering technologists is shown in Figures 1 and 2. In Indiana the two-year program at three public institutions will be discussed later in section 6-a. These figures show that a need for a four-year program in civil engineering technology does exist.

e. Expert Opinion. As cited earlier, the U.S. Bureau of Labor Statistics estimates that the number of civil engineer employment opportunities will increase by 24.3% from 2008 to 2018. In addition, few letters of support from experts for the development of this program are included to this proposal.

5. Regional, State, and National Factors

a. There are three civil engineering technology programs in Indiana:

- Indiana University/ Purdue University/ Fort Wayne (IPFW)
- Indiana University/ Purdue University/ Indianapolis (IUPUI)
- Purdue University/Calumet Campus/ Hammond

The associate of science program at these institutions help the students prepare for a bachelor's degree in construction engineering technology.

b. The curriculum in the civil engineering technology program is designed to equip graduates to face the challenge of modern engineering practice. The major emphasizes applications-based engineering studies involving the planning, analysis, and design of civil engineering/surveying projects. Modern approaches to the planning, analysis, and design of highways, structures, hydraulic systems, and site development will be emphasized. This technical instruction with modern instrumentation, hardware, and software will be reinforced with foundation courses emphasizing written and oral communication and the physical sciences. All of the instruction will be presented with problem-solving in mind and a strong emphasis on applications and critical thinking. The major will prepare students for the Fundamentals of Engineering Examination–the first step in registering as a professional engineer in the State of Indiana.

c. Professional Registration

Professional Engineer: In Indiana and approximately 35 other states in America, the bachelor of science in civil engineering technology degree, along with the appropriate number of years of experience and the passage of two eight-hour examinations will qualify a graduate to become a licensed professional engineer. The professional examination can be taken while the student is a senior enrolled in a CVET curriculum.

Licensed Land Surveyor: CVET majors whose curriculum contains at least six elective hours of surveying course work will meet the educational requirements to become licensed as a professional land surveyor in Indiana after they acquire four years of acceptable experience and pass the professional examinations.

Accreditation: The CVET program will be accredited by the Technology Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone: (410) 347-7700.

D. Program Implementation and Evaluation

Implementation

The CVET Program will be marketed through the following means:

- Web sites of the University, college, and department
- Newsletters and alumni publications
- Brochures for current ISU baccalaureate students, and students at other

institutions, and targeted employers
- Status and recognition afforded by accreditation
- Networking accomplished by the many College of Technology collaborations with advisory committees, industrial projects, grants, and contracts involving business and industry partners
- Professional affiliations of the faculty

The last bullet is somewhat unique to the College of Technology's historic and continuing community engagement and experiential learning environment. The faculties of CVET Program have many professional certifications and are heavily involved with the leadership of their professional societies. Much networking is accomplished via the faculty's professional collaborations.

Evaluation

The engineering technology programs within the College of Technology have functioning outcomes assessment plans. The CVET Program will use a subset of the existing plans. In addition to outcomes assessment, all college programs are reviewed periodically for alignment with University, college, and department goals and strategic plans. This program well fits those goals and strategic plans.

1. Quality and efficiency

Along with outcomes assessment and normal ISU oversight, the primary measure of quality and efficiency will be via an accrediting body. The B.S. in CVET Program will seek an ABET accreditation which will ensure the quality and efficiency of the program.

2. Appropriateness of CVET program to institution's identity and mission

Table 7 summarizes the mission and selected goals of ISU, College of Technology, the Department of Applied Engineering and Technology Management, and B.S. in civil engineering technology program.

Table 7: Appropriateness of CVET Program to Institution's Identity and Mission

Mission			
ISU	College of Technology	Department	CVET Program
Indiana State University will combine a tradition of strong undergraduate and graduate education with a focus on community and public service. It will integrate teaching, research, and creative activity in an engaging, challenging, and supportive learning	The College of Technology will provide exemplary undergraduate and graduate programs, generate solutions and knowledge through research, and serve the technology needs of the state, the nation, and the	Through teaching, research, and service, the department will create and develop knowledge in fields, producing value-added student scholars.	The mission of the bachelor of science in civil engineering technology will be consistent with that of the University at all levels. Using existing resources, this program will continue a tradition of producing value

environment to prepare productive citizens for Indiana and the world.	international community.		added student scholars through teaching, research, and service.
Selected Goals			
ISU	College of Technology	Department	CVET Program
Increase enrollment and student success. Advance experiential learning Enhance community engagement Diversify revenue through philanthropy, contracts, and grants	Be recognized as a global leader in the preparation of future professionals for careers in technology and teachers/trainers for industry and education. Continue to increase participation of underrepresented groups in technology careers. Develop critical thinking, problem solving, and communication skills through the use of practical experiences. Provide the knowledge and skills to prepare people to create, understand, apply, manage, and evaluate technology ethically and responsibly. Contribute to the areas of state economic development, technology transfer, professional development, and community service. Extend partnerships with schools, businesses, industry, and other agencies through co-op programs, internships, and research, and develop projects to expand access to higher education and better prepare the future workforce. Evaluate, refine, and enhance all academic programs to assure a sound basis for lifelong learning and living in a	Increase enrollment and student success. Continue leadership in advancing experiential learning and community engagement. Investigate possible programs of promise and distinction within the department. Continue to seek revenue through contracts and grants. Seek to provide mentoring to maintain great faculty and staff.	Enhance students: • Critical thinking skills in the application of electronic, mechanical, and related/interdisciplinary technologies. • Personal commitment of continuous self-improvement, with the intent of keeping current within their chosen discipline and generating knowledge for the purpose of enhancing the knowledge base within their chosen field. • Team oriented behaviors and leadership skills that serve to maximize team effectiveness. • Sense of ethical, professional, and socially responsibility.

	multi-cultural and interdependent world. Maintain a concern for future developments, be known for innovativeness, and participate in the search and application of new technologies.		

3. Availability of similar programs

Despite the fact that there are several four-year civil engineering technology programs located in other states, there is no B.S. in civil engineering technology program available within the State of Indiana for state resident students.

4. Personal and social utility

The B.S. in CVET will provide students with employment access to different industries. Students will find job and career satisfaction via the variety of technologies they encounter within their grasp.

5. Student demand

Student demand has been discussed with related figures in section C-2.

6. Student access

Students from Indiana and neighboring states will have access to this program. The program starts with on-campus delivery, scheduled for spring of 2012, and will be available via distance education in the future to potential students in the nation and around the world.

7. Flexibility of program design

The program will include foundational studies (general education) and a technical core as well as elective courses to give flexibility to students. The majority of the courses will be offered via distance education that provides additional flexibility to students who may have time and location constraints.

8. Market demand

Market demand has been discussed earlier in section C-2.

9. Inter-institutional and interdepartmental cooperation

This program will be housed in the Department of Applied Engineering and Technology Management. The curriculum will utilize existing courses within the Departments of Applied Engineering and Technology Management and Built Environment in the college of technology, and foundational studies (general education) courses in other colleges of ISU.

10. Flexibility of providing instruction

Most of the classes will be offered on-campus as well as at distance to provide flexibility to the students who may have time or location bound constraints.

E. Tabular Information

1. Table 8: Enrollment and Completion Data—see page 16

2. Table 9A and 9B: Cost and Revenue Data—see pages 18 and 19

3. Table 10: New Program Proposal Summary—see page 20

Table 8: Program Enrollments and Completions -
Annual Totals by Fiscal Year (Use SIS Definitions)

Campus: Indiana State University
Program: B.S. in Civil Engineering Technology
Date: May 16, 2011

	Total Year 1	Total Year 2	Total Year 3	Total Year 4	Total Year 5
	2012	2013	2014	2015	2016
A. Program Credit Hours Generated					
1. Existing courses	112.5	180	270	399	592.5
2. New courses	0	0	90	138	210
TOTAL	112.5	180	360	537	802.5
B. Full-Time Equivalents (FTE's)					
1. FTE's generated by full-time students	5	9	15	23	35
2. FTE's generated by part-time students	2.5	3	5	6	7.5
TOTAL	7.5	12	20	29	42.5
3. On-campus transfer FTE's	0	0	0	0	0
4. New-to-campus FTE's	7.5	12	20	29	42.5
C. Program Majors (headcount)					
1. Full-time students	5	9	15	23	35
2. Part-time students	5	6	10	12	15
TOTAL	10	15	25	35	50

3. On-campus transfers	0	0	0	0	0
4. New-to-campus majors	10	15	25	35	50
5. In-state	10	15	25	35	50
6. Out-of-state	0	0	0	0	0
D. Program Completions	0	0	0	3	7

Table 9A: Total Direct Program Costs and Sources of Program Revenues

Campus: Indiana State University
Program: B.S. in Civil Engineering Technology
Date: May 16, 2011

	Total Year 1 2012		Total Year 2 2013		Total Year 3 2014		Total Year 4 2015		Total Year 5 2016	
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost
A. Total Direct Program Costs										
1. Existing departmental faculty resources	0	$0	0	$0	0	$0	0	$0	0	$0
2. Other existing resources		$0		$0		$0		$0		$0
3. Incremental resources (See Table 2B)		$4,000		$4,000		$4,000		$4,000		$4,000
TOTAL		**$4,000**		**$4,000**		**$4,000**		**$4,000**		**$4,000**

B. Sources of Program Revenues	Total Year 1 2012	Total Year 2 2013	Total Year 3 2014	Total Year 4 2015	Total Year 5 2016
1. Reallocation	$0	$0	$0	$0	$0
2. New-to-campus student fees	$48,450	$80,682	$134,470	$198,934	$295,630
3. Other (non-state)	$0	$0	$0	$0	$0
4. New state appropriations:					
a. Enrollment change funding	0	0	0	0	0
b. Other State funds	0	0	0	0	0
TOTAL	$48,450	$80,682	$134,470	$198,934	$295,630

Table 9B: Total Direct Program Costs and Sources of Program Revenues

Campus: Indiana State University
Program: B.S. in Civil Engineering Technology
Date: May 16, 2011

	Total Year 1 2012		Total Year 2 2013		Total Year 3 2014		Total Year 4 2015		Total Year 5 2016	
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost
1. Personal Services										
a. Faculty	0	$0	0	$0	0	$0	0	$0	0	$0
b. Support staff	0	$0	0	$0	0	$0	0	$0	0	$0
c. Graduate teaching assistants	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL	0	$0	0	$0	0	$0	0	$0	0	$0
2. Supplies and Equipment										
a. General supplies/equipment		$0		$0		$0		$0		$0
b. Recruiting		$2,000		$2,000		$2,000		$2,000		$2,000
c. Travel		$2,000		$2,000		$2,000		$2,000		$2,000
d. Library/acquisitions		$0		$0		$0		$0		$0
TOTAL		$4,000		$4,000		$4,000		$4,000		$4,000
3. Equipment										
a. New equipment necessary for program		$0		$0		$0		$0		$0
b. Routine replacement		$0		$0		$0		$0		$0
TOTAL		$4,000		$4,000		$4,000		$4,000		$4,000
4. Facilities										
5. Student Assistance										
a. Graduate fee scholarships		$0		$0		$0		$0		$0
b. Fellowships		$0		$0		$0		$0		$0
TOTAL		$0		$0		$0		$0		$0
Sum of All Incremental Direct Costs		$4,000		$4,000		$4,000		$4,000		$4,000

Table 10: New Program Proposal Summary

I. Prepared by Institution: Indiana State University

Institution Location: Terre Haute, Indiana
Program: B.S. in Civil Engineering Technology
Proposed CIP Code: 15.0201
Date: May 16, 2011

	Total Year 1 2012	Total Year 2 2013	Total Year 3 2014	Total Year 4 2015	Total Year 5 2016
1. Enrollment Projections (headcount)					
Full-time	5	9	15	23	35
Part-time	5	6	10	12	15
TOTAL	10	15	25	35	50
2. Enrollment Projections (FTE)					
Full-time	5	9	15	23	35
Part-time	2.5	3	5	6	7.5
TOTAL	7.5	12	20	29	42.5
3. Degree Completion Projections	0	0	0	3	7
4. New State Funds Requested (actual)	$0	$0	$0	$0	$0
5. New State Funds Requested (increases)	$0	$0	$0	$0	$0

II. Prepared by CHE

1. New State funds to be considered for recommendation (actual)	$	$	$	$	$
2. New State funds to be considered for recommendation (increases)	$	$	$	$	$

REFERENCES

1. *The Summit on the Future of Civil Engineering 2025*, June 21-22, 2006, American Society of Civil Engineering.
2. American Society of Civil Engineers: http://www.asce.org/
3. U.S. Conference of Mayors: http://www.usmayors.org/
4. The American Public Works Association: http://www.apwa.net/
5. U.S. Department of Labor: http://www.dol.gov/
6. Association of American Colleges and Universities: http://www.aacu.org/
7. Wiedenhoft, Ronal V., Liberal Arts and International Studies, Colorado School of Mines, *Journal of Engineering Education*, January 1999.
8. Indiana Department of Workforce Employment: http://www.hoosierdata.in.gov/
9. State University of New York Institute of Technology: http://www.sunyit.edu/
10. Old Dominion University: http://www.odu.edu/
11. Engineering Workforce Commission: http://www.ewc-online.org/

APPENDICES

APPENDIX A: PROGRAM OF STUDY

Indiana State University - B.S. in Civil Engineering Technology			
Year 1			
FALL SEMESTER		**SPRING SEMESTER**	
Number - Course Title	**Credits**	**Number - Course Title**	**Credits**
MET 130 - Introduction to Engineering and Technology	3	CNST 201 - Construction Contract Documents	3
MET 103 - Introduction to Technical Graphics	2	Math 123 - Analytic Geometry and Linear Algebra for Engineers	3
CNST 111 - Construction Materials, Methods, and Equipment	3	PHYS 105/105L - General Physics/Laboratory	4
ENG 101 - Fundamentals of Writing	3	TMGT 195 - Introduction to Computer Applications or MET 299 - CAD Fundamentals	3
Math 115 - College Algebra or MET 215 - Graphic Analysis	3	COMM 101 - Introduction to Speech Communications	3
COMM 101 - Introduction to Speech	3	Eng 105 - Freshman Writing II	3
Term Total	**17**	**Term Total**	**16**
Running Total	**17**	**Running Total**	**33**
Year 2			
FALL SEMESTER		**SPRING SEMESTER**	
Number - Course Title	**Credits**	**Number - Course Title**	**Credits**
ENVI 170/170L - Earth Science/Laboratory	4	ENVI 401 - Geographic Information Systems	3
MET 329 - Fluid Power Technology	3	MET 302 - Applied Statics	3
Foreign Language Course	3	MATH 301 - Fundamentals and Application of Calculus	3
CNST 320 - Soil Analysis and Testing	3	Social or Behavioral Sciences course	3
PE 101/101L - Fitness for Life	2	Historical Studies	3
		Global Perspectives and Cultural Diversity	3
Total Term	**15**	**Total Term**	**18**
Running Total	**48**	**Running Total**	**66**
Year 3			
FALL SEMESTER		**SPRING SEMESTER**	
Number - Course Title	**Credits**	**Number - Course Title**	**Credits**
ENVI 454 – Introduction to Hydrology	3	CVET 401 - CAD-Based Applications in CVET and Surveying	3
ENG 305T - Technical Writing	3	CVET 410 - Structural Analysis and Reinforced Concrete Design	3
MET 406 - Strength of Materials	3	Elective	3
Elective	3	MET 304 - Engineering Analysis (Dynamics)	3
Foreign Language course	3	Upper Division Integrative Electives	3
Literary Studies course	3		
Total Term	**18**	**Total Term**	**15**
Running Total	**84**	**Running Total**	**99**
Year 4			
FALL SEMESTER		**SPRING SEMESTER**	
Number - Course Title	**Credits**	**Number - Course Title**	**Credits**
CVET 411 - Waste Water System Design	3	MET 405 - Economics Analysis For Engineering and Technology	3
CVET 420 - Highway Design	3	MET 409 - Senior Project	3
CNST 420 - Plane Surveying	3	MET 430 - Senior Seminar	1
Elective 3	3	Fine and Performing Arts	3
Upper Division Integrative Electives	3	Ethics and Social Responsibility	3
		Upper Division Integrative Electives	3
Total Term	**15**	**Total Term**	**16**
Running Total	**114**	**Running Total**	**130**

APPENDIX B: LETTERS OF SUPPORT

UNIVERSITY OF
LOUISVILLE.

Department of Civil and Environmental Engineering

November 16, 2010

Dr. Brad Sims
Dean, College of Technology
Indiana State University

Dear Dr. Sims:

I am writing this letter in support of the proposed civil engineering technology program at College of Technology of Indiana State University.

I am the Immediate Past President of the American Society for Engineering Education and served as ASEE president during 2009-10. I have also been professor and chair of the Civil Engineering Department at the University of Louisville for the past four years and teaching civil engineering for the past 24 years. I am familiar both with the need for engineering technology graduates nationwide and specifically, the current need in Indiana and Kentucky for civil engineering professionals.

There have been very well documented discussions regarding the construction of two bridges on the Ohio River connecting Southern Indiana and Kentucky in the Louisville metropolitan area. This is projected to be a 20 plus year project during which many professionals working in civil engineering related fields will be in demand in both Indiana and Kentucky. The opportunities for high school graduates to become civil engineering technologists both in Indiana and Kentucky are currently very limited. It is my professional opinion that the creation of a civil engineering technology program at Indiana State University will fill this void and will afford young minds, as well as those searching for a second career, the opportunity to participate in a technology field that will be very much in demand in the near future in this region, as well as nationwide.

Please do not hesitate to contact me in case of any questions.

Best Regards,

J. P. Mohsen
Professor and Chair

/gg

J. B. Speed School of Engineering • University of Louisville • Louisville, KY 40292
P: 502.852.6276 **F:** 502.852.8851 **W:** louisville.edu

APPENDIX B: LETTERS OF SUPPORT

November 5, 2010

Dear Dr. Shahhosseini:

As a former faculty of Civil Engineering as well as a Senior Bridge Engineer, this letter states my personal opinion regarding Civil Engineering Technology program under development at Indiana State University. According to recent article by American Society of Civil Engineering (ASCE), there will be high demand for civil engineers in coming decades. Major advancements in the US transportation infrastructure including the interstate highway system happened in 1950s and the following decade. In other words, most of the structures are over fifty years old and they will eventually need to be rehabilitated or replaced. Considering growth and attraction of high tech engineering majors in the past two decades number of civil engineering students dropped for several years. As a result of this drop, large population of experienced civil engineers in bridge industry is over 50 years old and close to retirement. Combination of these factors highlights nation's emerging need to civil engineers to sustain and improve the transportation structures and facilities. Considering nature of construction industry, fresh graduates mostly require several years of job specific training before reaching to the desired level of experience and efficiency.

Reviewing the proposed curriculum of your program, I see a fine combination of theoretical and practical education that will make it easier and faster for ISU-CVET graduates to be absorbed by industry and government agencies. The growing need for construction engineers is expected to be more than other branches of civil engineering. Most of the civil engineering programs offer limited number of classes in construction management and methods, estimating, specification development, quality control and quality assurance. However your proposed program has advantage of prioritizing these important topics. Reviewing your proposed curriculum, I am confident that you will train highly qualified engineers who can work as construction lead engineers and managers, inspectors, estimators, and construction specification developers. There will be high demand for graduates to be hired in high profile and challenging construction projects, specifically bridges, tunnels, and other transportation structures.

Please let me know if you need any further information.

A. M. Malek

Amir M. Malek, PE, PhD
Senior Bridge Engineer (Technical Specialist)

APPENDIX B: LETTERS OF SUPPORT

Dr. Sims:

On behalf of the Asphalt Pavement Association of Indiana and its 75 member firms, please accept this letter of support for the formation of a civil engineering technology program at Indiana State University. This degree program would well complement the existing construction management program which your institution is well known for. Many of our member firms seek to hire not only construction management degree holders, but also students with a strong academic background in the principles of civil engineering, particularly those with coursework in pavement or materials. Along with the Indiana Department of Transportation, the highway construction industry is a strong and growing industry in our state as our members build Indiana's highway and transportation infrastructure. The Indiana DOT alone currently has a $1.2 billion dollar annual construction program and degreed civil engineers are integral to the success of this program wither they work for consulting engineers, municipal or county government, state agencies such as INDOT, or construction contractors like those who belong to APAI. Civil engineers are also heavily engaged in the vertical building segment of the construction industry.

I believe that there is an appetite within the transportation construction industry in Indiana to hire more civil engineering technology graduates if they are available. Research shows that the construction industry depends on many engineers who are nearing retirement age. These jobs are well paying positions that quickly can lead to middle and senior management positions in a recession-resistant industry. APAI and its member firms want to express our support and encouragement to you and your ISU colleagues as you develop and implement this new degree program. Doing so will offer future ISU graduates a rewarding career option that yields outstanding personal satisfaction. Our employees tell me that individually they take great pride in looking at a newly constructed road or bridge project and saying "I built that." Indiana markets itself as the "Crossroads of the Nation" due to our outstanding highway and transportation infrastructure, and it takes talented and trained civil engineers to maintain and expand that significant public investment.

Cordially,

Bill
--
William I. Knopf, Executive Director
Asphalt Pavement Association of IN
101 West Ohio Street, Suite 710
Indianapolis, IN 46204
317.632.2441 office, 317.910.5493 cell
<http://www.asphaltindiana.org>

APPENDIX C: FACULTY QULIFICATIONS

<table>
<tr><td>Name:
Bradford L. Sims
Professor of Construction Management
Dean of the College of Technology</td><td>Office Phone: 812-237-3166

E-mail: brad.sims@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
Ph.D. in Industrial Technology/Curriculum and Instruction, Purdue University, 1999
M.S. in Building Construction, University of Florida, 1996
B.S. in Building Construction Technology, Purdue University, 1990</td><td>Research Interest:
Lean construction
Technology applications in construction
Leadership factors in construction</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
Founded and headed the construction management undergraduate program at Western Carolina University, growing it from zero majors in 2002 to 400 majors by 2007.
Instituted the complete on-line master of construction management graduate program (2005), a collaborative degree arranged with the College of Business very successful on-line master of project management degree. Grew program to 30 majors (fall 2008).
Attracted Joe Kimmel from a large national construction executive search firm that provided a $10.4 million endowment for the new School of Construction Management and Technology (2005), representing the largest donation in the history of Western Carolina University.</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected):
Ford, G., Patterson, J., & Sims, B.L. (2009). How to determine construction project rain delay times using local rainfall databases in Asheville, American Society of Civil Engineering: Proceedings of the 2009 Construction Research Congress, North Carolina.
Jensen, D., & Sims, B.L. (2008). Restitution: Applying quantum meruit to the construction contracting process. The American Professional Constructor, Journal of the American Institute of Constructors, 32(2), 41-47.
Jensen, D., Sims, B.L., & Mau, R. (2007). The General Indemnity Agreement: Can it also function as a secured transaction? Yes, The American Professional Constructor, Journal of the American Institute of Constructors, 32(1), 16-22.
Sims, B.L., Ferguson, C.W., & Birnberg, H. (2006). Computer graphics history and effects on a current construction management curriculum, The American Professional Constructor, Journal of the American Institute of Constructors, 30(1), 7-10.
Orth, D. L., Sims, B.L., & Alter, K.D. (2003). Improving professionalism in the construction industry, The American Professional Constructor, Journal of the American Institute of Constructors, 27(2), 41-44.</td></tr>
<tr><td>Relevant teaching experience:
Almost 15 years experience teaching undergraduate and graduate courses.</td><td>Industrial Practice:
President of constructioneducation.com
Full-time experience in industry as a project controls supervisor, a cost engineer, and project control engineer.</td></tr>
</table>

APPENDIX C: FACULTY QULIFICATIONS

<table>
<tr><td>Name:
Robert E. English, Associate Dean, College of Technology, Professor of Electronics and Computer Engineering Technology</td><td>Office Phone: 812-237-2307

E-mail: Robert.English@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
Ed.D. in Instructional Systems Technology, Cognate in Industrial Technology, Indiana University, 1992.
M.S. in Industrial Professional Technology, Indiana State University, 1981.
B.S. in Electronics with a minor in Computer Technology, Indiana State University, 1975.</td><td>Research Interest:
Supply Chain
Unmanned Systems
Crisis Leadership
Automation</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
Associate Vice President of Academic Affairs, 2003- 2011
Indiana Air National Guard, Lt. Colonel and Commander of the 181st Logistics Readiness Squadron, served for 40 years</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected)
Presented at a two day Moroccan Ministry of Education workshop concerning the development of National Accreditation System in Morocco.
Carnegie Conference for Carnegie Doctoral/Research Intensive Institution – Illinois State University, Bloomington-Normal (July 10 and 11, 2005).</td></tr>
<tr><td>Relevant teaching experience:
Twenty-nine years experience teaching in higher education.</td><td>Industrial Practice:
Manufacturing Engineering Manager for Zenith Radio Corporation in Paris, Illinois.</td></tr>
</table>

APPENDIX C: FACULTY QULIFICATIONS

<table>
<tr><td>Name:
Kara Harris
Director of Undergraduate Academic Student Services
College of Technology</td><td>Office Phone: 812-237-9633

E-mail: Kara.Harris@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
Ed.D. in Career and Technical Education, Clemson University, 2004.
M.S. in Technology Education, Indiana State University, 2000.
B.S. in Printing and Industrial Supervision, Indiana State University, 1996.</td><td>Research Interest:
Recruitment and Retention in Technology Programs
Technology and Engineering Education</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
Member of ASEE, ITEEA, and ACTE
Teaching Certification in Technology and Engineering Education, 1998</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected)
Tiala, S. & Harris, K. (Accepted). The right time for recruiting new colleagues. The Technology and Engineering Teacher.
Kaluf, K. & Harris, K. (2010). Students must understand theory and practice in technology and engineering education. Journal of Industrial Teacher Education. 46(2) Pgs. 125-131.
Veurnick. A., Hamlin, A., Kampe, J., Sorby, S., Blasko, D., Holliday, K., Trich, J., Harris, L., Connolly, P., Sadowski, M., Harris, K., Brus, C., Boyle, L., Study, N., & Knot, T. (2009). Enhancing Visualization Skills-Improving Options and Success (EnViSIONS) of Engineering and Technology Students. Engineering Design Graphics Journal. 73(2) Pgs. 2-17.
Harris, K, Harris, L, & Sadowski, M. (2009). Measuring spatial visualization in pre-service technology and engineering teachers. American Society for Engineering Education Engineering Design Graphics Division Conference Proceedings. On-line retrieval at: http://edge.asee.org/conferences/proceedings/63rdMid/papers/harris_monday.pdf
Harris, K. & Rogers, G. Soft skills in the technology education classroom. The Technology Teacher. November, Pgs. 19-42
Harris, K. (2008). Recruitment and Retention in Engineering/Technology Teacher Education: Factors that Influence Females. 2008 American Association for Engineering Education Proceedings, Pgs.1-12. On-line retrieval at: http://www.asee.org/conferences/ac2008.proceedings.cd/papers/688_RECRUITMENT_IN_ENGINEERING_TECHNOLOGY_TE.pdf
Harris, K & Rogers, G. (2008). Preparing Tomorrow's Teachers: Infusing the Standards for Technological Literacy and Engineering Competencies into Technology Teacher Education Programs. Journal of Industrial Teacher Education. 45(5).</td></tr>
<tr><td>Relevant teaching experience:
Five years experience teaching primary and secondary technology and engineering education and eight years experience teaching undergraduate and graduate courses.</td><td>Industrial Practice:</td></tr>
</table>

APPENDIX C: FACULTY QULIFICATIONS

<table>
<tr><td>Name:
M. Affan Badar
Chairperson and Associate Professor
Department of Applied Engineering and Technology Management</td><td>Office Phone: 812-237-3982

E-mail: M.Affan.Badar@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
Ph.D. in Industrial Engineering, University of Oklahoma, 2002.
M.S. in Mechanical Engineering, K.F. University of Petroleum and Minerals, 1993.
M.S. in Industrial Engineering, Aligarh Muslim University, 1990.
B.S. in Mechanical Engineering, Aligarh Muslim University, 1988.</td><td>Research Interest:
Coordinate Metrology
Lean Manufacturing
Health Care
Supply Chain
Energy System Design
Failure Analysis
Stochastic Modeling and Reliability</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
ASME member, IIE senior member, SME senior member, and ATMAE professional member
ABET Program Evaluator Training, Apr 2010
Certified Senior Technology Manager, ATMAE, Dec 2009</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected)
Badar, M.A., Zhou, M., & Thomson, B. (2010). Application of QFD into the design process of a small job shop. IAJC International Journal of Modern Engineering, 10(2), 69-75.
Chandler, M., & Badar, M.A. (2009). Effect of Individual Components on System's Reliability: A Case of Web-Based US Federal Highway Administration Project Recommendation and Approval Software. Emerald International Journal of Quality and Reliability Management, 26(6), 614-628.
Badar, M.A., Gardner, L., & Sammidi, S.S. (2009). Profit analysis of supply chain ordering strategies. IIE Annual Conference 2009, IERC Track: Engineering Economics, Session: Engineering Economics 2.
El Mounayri, H., Badar, M.A., & Rengifo, G.A. (2008). Multi-parameter ANN Model for flat-end milling. CSME, Transactions of the Canadian Society for Mechanical Engineering, 32(3-4), 523-536.
Pondhe, R., Asare, S.A., Badar, M.A., Zhou, M., & Leach, R. (2006). Applying lean techniques to improve an Emergency Department. Proceeding of the IIE Annual Conference 2006, Session: IERC03 Engineering Management 6, CD-ROM.</td></tr>
<tr><td>Relevant teaching experience:
Fifteen years experience teaching undergraduate and graduate courses.</td><td>Industrial Practice:
Worked in industry as a mechanical design engineer and manufacturing engineering intern.</td></tr>
</table>

APPENDIX C: FACULTY QULIFICATIONS

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<tr><td>Name:
Ming Zhou
Professor
Department of Applied Engineering and Technology Management</td><td>Office Phone: 812-237-3983

E-mail: Ming.Zhou@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
Ph.D. in Systems and Industrial Engineering, The University of Arizona, 1995
B.S. in Mechanical Engineering, Wuhan Institute of Technology, 1982</td><td>Research Interest:
Knowledge-based Simulation Modeling for Discrete Manufacturing Systems
Pattern and Knowledge-based Modeling and Simulation of Logistics and Distribution Systems
Data Mining and Rule Formation with Neural Networks, Knowledge Extraction from Massive Data/ Database
Artificial Intelligence (AI) in the Design and Control of Engineering Systems</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
Member, Institute of Industrial Engineers (IIE), 1994–present
Member of the Editorial Board, International Journal of Industrial Engineering, 1997–present
Member of the Editorial Board, Journal of Simulation, 2006–present
1999, 2001, 2003, 2004, 2005, 2006 Session/track Chairs, 8th and 10th Industrial Engineering Research Conference (IERC99); and Winter Simulation Conferences (WSC).
Since 1996: invited referee for Journal of Computers and Industrial Engineering, IIE Transactions (Design & Manufacturing Systems), IEEE Transactions (Neural Networks), Prentice Hall (Reliability analysis), Reviewers for IERC97, 98, 99, 2000; and WSC04 and 05.</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected):
Zhou, M., Chen, Z., & Setavoraphan, K. (2005). Conceptual simulation modeling of warehousing operations. Proceedings of the 2005 Winter Simulation Conference, Orlando, Fl.
Zhou, M., Son, J., & Chen, Z. (2004). Knowledge representations for conceptual simulation modeling. Proceedings of the 2004 Winter Simulation Conference. Washington D.C.
Zhou, M., & Paik, J. (2004). An application of neural network and genetic algorithm for optimizing food extrusion process parameters. International Journal of Industrial Engineering, 11(2), 132-139.</td></tr>
<tr><td>Relevant teaching experience:
Almost 20 years experience teaching undergraduate and graduate courses.</td><td>Industrial Practice:
Five years industrial experience as a project coordinator and engineer.</td></tr>
</table>

APPENDIX C: FACULTY QULIFICATIONS

<table>
<tr><td>Name:
A. Mehran Shahhosseini
Assistant Professor
Department of Applied Engineering and Technology Management</td><td>Office Phone: 812-237-3349

E-mail: ashahhosseini@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
D.Eng. in Mechanical Engineering, Lamar University, 1999
M.Sc. in Materials Engineering, Isfahan University of Technology, 1991
B.Sc. in Metallurgical Engineering, Tehran University, 1991</td><td>Research Interest:
Finite Element Modeling and Analysis
Automotive Structural Analysis
Computer Aided Design (CAD)
Manufacturing Processes of Materials
Extraction Metallurgy</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
Member, Society of Automotive Engineers (SAE)
Member, American Society of Mechanical Engineers (ASME)
Member, Society of Manufacturing Engineers (SME) student chapter, faculty member, 2009
Engineer-in-Training (EIT) certificate, 1999
Top Ten Faculty Favorites out of 237 faculty members, University of Louisville, 2007</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected):
Shahhosseini, A.M., Prater, G., Osborne, G., Kuo, E., & Mehta, R. (2010). Major compliance joint modeling for automotive body structures. International Journal of Vehicle Systems Modeling and Testing, 5(1).
Shahhosseini, A.M., & Prater, G. (2010). Beam-Like Major Compliant Joint methodology for automotive body structures. ASME International Mechanical Engineering Congress and Exposition, Vancouver, Canada.
Prater, G., Shahhosseini, A.M., Osborne, G., Lone, J., & Zhang, S. (2010). Simulation studies for determining hydraulic hybrid powertrain subframe response characteristics. International Journal of Heavy Vehicle Systems, 17(2).
Kuo, E., Mehta, P., Shahhosseini, A.M., & Prater, G. (December, 2004). Analytical benchmarking of body architectural efficiency (Ford versus Honda Civic). Ford Research and Advanced Engineering Technical Reports, SRR-2004-0207.</td></tr>
<tr><td>Relevant teaching experience:
Fourteen years experience teaching undergraduate and graduate courses.</td><td>Industrial Practice:
Almost five years industrial experience as a senior research engineer and co-op engineer.</td></tr>
</table>

APPENDIX C: FACULTY QULIFICATIONS

<table>
<tr><td>Name:
Todd E. Alberts
Instructor
Department of Applied Engineering and Technology Management
Mechanical Engineering Technology Program</td><td>Office Phone: 812-237-3357

E-mail: Todd.Alberts@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
M.S., Indiana State University, 2007
B.S., Indiana State University, 2005
A.S., Ivy Tech State College, 1988</td><td>Research Interest:
Engineering/Design Education
Computer Aided Design
Lean Manufacturing
Engineering Management</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
Instructor, Indiana State University, College of Technology
ASME Student Chapter faculty advisor
Member of ASME, ASEE, and SAE</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected):
Alberts, T. E. (in press). An experimental evaluation of performance variance for internally threaded geometry related to extended tap wear in low carbon steel. International Journal of Industrial Manufacturing.
Alberts, T. E., Badar, M. A., & El-Mansour, B. (2005).Teaching engineering economics to engineering technology students. Proceedings of the IIE Annual Conference, research track: engineering economics, CD-ROM, Atlanta, GA.
Alberts, T. E. (2006). Managing the human element of the lean manufacturing culture, management track. NAIT National Conference, Cleveland, OH.</td></tr>
<tr><td>Relevant teaching experience:
Laboratory based hands-on experiential learning based education.</td><td>Industrial Practice:
Seventeen years real-world industrial experience in various engineering related roles.</td></tr>
</table>

APPENDIX C: FACULTY QULIFICATIONS

<table>
<tr><td>Name:
Lee A. Ellingson
Program Coordinator, Construction Management Program
Department of the Built Environment</td><td>Office Phone: 812-237-3372

Email: lee.ellingson@indstate.edu</td></tr>
<tr><td>Degrees / Schools:
Ph.D. in Construction Science, Texas A&M University, 1997
M.S. in Architecture, University of Texas at Austin, 1975.
B.S. in Communications, University of Texas at Austin, 1971.</td><td>Research Interest:
Energy Efficiency in Building Design
Smart Grid
Sustainable Construction
Moisture Control in Buildings</td></tr>
<tr><td colspan="2">Professional Activities and Accomplishments:
American Institute of Architects (AIA)
National Council of Architectural Registrations Boards (NCARB)
American Council of Construction Education (ACCE)
Associated Schools of Construction (ASC)
Sigma Lambda Chi, the honorary society for construction</td></tr>
<tr><td colspan="2">Presentations and Publications (Selected)
Project Delivery Systems, Tips and Traps. AGC Educator’s Conference, 2003.
An Evaluation of the Good Cents Program in College Station, Texas. ASC Proceedings, 1998.
An Introduction to the Standard Form Design-Build Contract Documents. ASC Proceedings, 2001.
Student Outcomes Assessment: A Case Study. ASC Proceedings 2002.
Quantifying Faculty Work Load: A Proposal. ASC Proceedings, 2005.
Measurement in Construction.” ASC Proceedings, 2006.</td></tr>
<tr><td>Relevant teaching experience:
Thirteen years experience teaching undergraduate and graduate courses.</td><td>Industrial Practice:
Worked as a practicing architect for over 20 years.</td></tr>
</table>