

**NEW INSTITUTE PROPOSAL**

**Submitted To**

**THE SOUTH CAROLINA COMMISSION ON HIGHER EDUCATION**

**Human Factors and Ergonomics Research Institute**

**Clemson University**

August 15, 2011



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## Human Factors and Ergonomics Research Institute

### I. CLASSIFICATION

**Program Title:** Human Factors and Ergonomics Research Institute

**Academic Unit:** Clemson University, College of Business and Behavioral Sciences and the College of Engineering and Science

**Designation, type, and level of degree:** n/a

**Proposed date of implementation:** January 2012

**CIP code from the current USDOE's Classification of Instructional Programs:** n/a

**Identification of Program as New or Modification:** New Institute

**Site:** Clemson University campus.

Program qualifies for supplemental Palmetto Fellows Scholarship and LIFE Scholarship awards: Yes \_\_\_\_\_ No  X

**Delivery mode:** n/a

### II. JUSTIFICATION

This application is for a new Human Factors and Ergonomics Research Institute (HFE Institute). The Clemson University Board of Trustees has already approved this Institute, and this proposal seeks state approval of the CHE as well. The HFE Institute will provide a structure for innovations in Human Factors and Ergonomics led by faculty in the Departments of Psychology, Industrial Engineering and Computer Science at Clemson University. Its primary focus is to apply cutting-edge scientific principles to the study of real-world problems involving the interaction of humans and technology in a wide variety of contexts, including the home, the workplace, the military, transportation, entertainment, etc.

Human factors and ergonomics is the scientific discipline concerned with the understanding of interactions between humans and technology, and it is the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance. Academic disciplines that commonly train individuals and perform research in human factors and ergonomics are psychology, industrial engineering, and computer science. At Clemson University many of these disciplines are housed within the College of Business and Behavioral Sciences and the College of Engineering and Science. It is also common for individuals from fields outside of these academic disciplines to conduct research in human factors and ergonomics (e.g.,

medicine, bioengineering, architecture, etc.). Hence, it is expected that faculty in other academic departments at Clemson University who perform research in human factors and ergonomics will also be active in the Institute.

At Clemson University, human factors and ergonomics faculty conduct research into human behavior and performance in a variety of contexts and settings including health care delivery environments, automobiles and home settings, in interactions with technology in general and computers in particular, and in high stress conditions such as military combat and other high risk environments. Research that explores the effect of complex and stressful conditions on human behavior and performance is of growing importance particularly as technology becomes more pervasive, life expectancy increases, and businesses, health care providers and governments seek ways to predict and influence human performance. Indeed, the field of Human Factors and Ergonomics advocates systematic use of such knowledge to achieve compatibility in the design of interactive systems of people, machines and environments to ensure their effectiveness, safety and ease of performance.

To put the diverse nature of the Human Factors and Ergonomics Research Institute into perspective, consider the following example. Current research at Clemson University has revealed that well over 80% of off-duty traffic fatalities among US military personnel involve human factors. Of particular concern is the extraordinarily large proportion of fatal accidents involving motorcycles. As a result, Clemson University scientists are developing a multidisciplinary line of research aimed at reducing 2-wheel motorcycle fatalities. In addition to the already developed relationship with national organizations like the Motorcycle Safety Foundation and the National Highway Transportation Safety Administration, a natural collaboration with CU-ICAR will be established. Equally important however, are the interactions that will emerge from multiple departments both at Clemson and partners among South Carolina's universities and community colleges. Put simply, from the design of personal protective equipment to human performance and roadway markings, Clemson University can quickly become the national leader in the field of motorcycle safety and performance.

## **II.1 Purpose and objectives**

The mission of the proposed HFE Institute is to provide a national model for the interdisciplinary study of safe and effective interactions between humans and emerging technologies.

The goals are to the goals of the Institute are threefold:

1. To unite the human factors and ergonomics faculty and provide a coordinated effort to bring national prominence to Clemson University within this rapidly growing research area.
2. To attract additional funding opportunities that would not otherwise be made available to Clemson University.
3. To provide support to faculty conducting research in human factors and ergonomics in finding and managing grants and contracts.

The above goals of the Institute provide the guiding principles to unite and strengthen existing programs of education and research at Clemson University and they provide the capability to build resources to be allocated toward these priorities. The human factors and ergonomics faculty at Clemson University have proven track records in graduate programs and research. However, these faculties are spread among multiple departments at Clemson University. Human factors and ergonomics often capture only a small portion of the mission and priorities of these departments. As a consequence, resources allocated specifically to human factors and ergonomics are often below the threshold that would lead the human factors and ergonomics programs to national prominence. A unifying Institute can accomplish this goal through shared and targeted resources.

### **II.2 Need for the institute**

During the past 5 years there has been over \$750,000 in active grant and contract expenditures that could be associated with the Institute if it existed. The goal is to reach \$1,000,000 in new annual funding activity associated with the Institute within a 5 year time period, then \$2,000,000 within 10 years.

### **II.3 Centrality of the institute to Clemson's mission and its relationship with existing programs at Clemson**

As the major stakeholders, the Psychology, Industrial Engineering, Computer Science and Electrical and Computer Engineering departments at Clemson have worked well together to both educate students, performing research and attract funding. It is unusual for these diverse departments to have such close ties and it is a testament to the interdisciplinary atmosphere that has been fostered at Clemson University. This strength is an attraction for graduate students and funding agents and can be leveraged by Clemson. A major purpose of the HFE Institute is to formalizing these cross-department, cross-college relationships in a way that can be acknowledged both internally and externally.

Externally, this union will afford better marketing of the capabilities of the individual programs and the Institute. For example, the Institute will fund advertisements at annual national meetings such as the Human Factors and Ergonomics Society, American Psychological Association, and SIGCHI, the conference on Human Factors in Computing. The Institute will also develop its own web site, which will focus on the collaborative research across the departments while also linking to the individual program web sites. This marketing will attract the attention of potential graduate students, future faculty members, research sponsors and industry partners, and thus it will support goals one and two.

Internally, this union will support goal number three in which resources can be shared, grown and managed efficiently to maximize the impact of existing funding and to achieve increased funding. For example, by routing their funded research through one administrative unit, it will be possible to allocate a portion of overhead returns to administrative support. Currently, no one department has sufficient funding to offer dedicated administrative support to the human factors and ergonomics research effort. By combining efforts and reaching a level of scale to justify administrative support, some

burden will be taken off of individual investigators, freeing up their time to secure additional funding, complete additional research and support additional students. It also can attract faculty who might not otherwise participate in funded research due to the administrative burden associated with managing a grant, including faculty who might increase their work in human factors and ergonomics if given the opportunity. Investigators will find it easier to involve more faculty members and students in funded research collaborations.

The HFE institute will support research in four of Clemson's Emphasis Areas; Automotive and Transportation Technology, Biotechnology and Biomedical Sciences, Family and Community Living, and Leadership and Entrepreneurship.

#### **II.4 Relationship of the institute to other programs in South Carolina and elsewhere**

Clemson University's Department of Psychology has the only accredited Human Factors graduate degree program in South Carolina. It is one of only fourteen such programs accredited by the Human Factors and Ergonomics Society ([http://www.hfes.org/Web/Students/grad\\_programs.html](http://www.hfes.org/Web/Students/grad_programs.html)). There are no other doctoral programs in Human Factors Psychology in South Carolina. Currently in the US there are only eighteen Human Factors Psychology programs offering the Ph.D. degree. North Carolina, Georgia, and Florida each have one university offering the Ph.D. in Human Factors Psychology and Virginia has two. The other states with at least one program are California, Connecticut, Illinois, Indiana, Kansas, New Mexico, Ohio, South Dakota and Texas. The Institute is the next logical extension of the successful graduate degree program at Clemson University.

Virginia Tech has a center that is similar in nature to the proposed institute (<http://hfec.vt.edu/>). However, Virginia Tech's center is concentrated in industrial engineering and is not an interdisciplinary institute like the one proposed here at Clemson University. The HFE Institute at Clemson University, once established, would make us more competitive with organized Centers such as those at Virginia Tech, with the advantage of having interdisciplinary teams involving psychologists, industrial engineers, computer scientists, electrical engineers and others.

#### **II.5 Relationship of the Institute to other institutions via inter-institutional cooperation:**

Once the Institute is established and infrastructure is in place, the Institute will submit a proposal for a large government funded "center" grant. This effort will link Clemson to other Universities and Centers such as the one described above at Virginia Tech. The initial Directors of the Institute have collaborators in both government and academic laboratories across the country.

#### **II.6 Assessment Plan:**

Roughly 2 years after establishment, the Institute will be assessed on the following criteria:

- 1) Multi-disciplinary research in the field of HF&E
- 2) Total sponsored research as laid out under "Sources of Funding" below

- 3) Participation by multiple departments and colleges
- 4) Establishment and funding of Institute scholars with overhead
- 5) Projects that enhance our standing in the academic community (Drive to top-20)

It is anticipated that the assessment will be done on an annual or bi-annual basis consistent with the evaluations of other Clemson University institutes.

### III. ENROLLMENT

Since the HFE Institute will not serve as a degree-granting academic unit, there are no admissions criteria or target enrollment figures. For this reason, the Projected Total Enrollment and Estimated New Enrollment tables have been omitted from this proposal. The students conducting research on sponsored programs that support HFE will be enrolled in degree-granting academic units at Clemson University. The academic departments in which the HFE affiliated faculty reside will be responsible for the administration of the student's programs and degree requirements. Research funds generated by HFE Institute faculty will provide for both thesis and non-thesis support (i.e., stipends, hourly salaries, etc.) for the students, including undergraduates.

### IV. CURRICULUM

The HFE Institute will neither offer courses nor administer a degree-granting program. Affiliated faculty will maintain their curriculum related duties within their home academic departments.

### V. FACULTY

**Table I**

<b>List Staff by Rank (e.g. Professor #1, Professor #2, Associate Professor #1, etc)</b>	<b>Highest Degree Earned</b>	<b>Field of Study</b>	<b>Teaching in Field (Yes/No)</b>
Professor #1	PhD	Psychology	Yes
Professor #2	PhD	Psychology	Yes
Professor #3	PhD	Psychology	Yes
Professor #4	PhD	Psychology	Yes
Professor #5	PhD	Psychology	Yes
Professor #6	PhD	Psychology	Yes
Professor #7	PhD	Psychology	Yes
Professor #8	PhD	Psychology	Yes

Professor #9	PhD	Industrial Engineering	Yes
Professor #10	PhD	Industrial Engineering	Yes
Professor #11	PhD	Computer Science	Yes
Professor #12	PhD	Computer Science	Yes
Professor #13	PhD	Electrical & Computer Engineering	Yes
Professor #14	PhD	Architecture	Yes
Professor #15	PhD	English	Yes
Associate Professor #1	PhD	Psychology	Yes
Associate Professor #2	PhD	Industrial Engineering	Yes
Associate Professor #3	PhD	Industrial Engineering	Yes
Assistant Professor #1	PhD	Psychology	Yes
Assistant Professor #2	PhD	Industrial Engineering	Yes
Assistant Professor #3	PhD	Industrial Engineering	Yes
Assistant Professor #4	PhD	Computer Science	Yes
Assistant professor #5	PhD	Bioengineering	Yes

Initially, HFE faculty will be constituted of those 23 faculty listed in Table I, who will submit grant applications through the Institute. All participating faculty will hold primary appointments in existing academic units and will be considered Associates of the institute. New faculty will be strategically added to support the HFE Institutes mission when new faculty members with HFE expertise are hired by Clemson University to support existing programs. At present, Dr. Eric Muth of the Department of Psychology will continue to serve as Director of the institute and Dr. Scott Shappell of the Department of Industrial Engineering will continue to serve as Associate Director. Associate faculty at the time of any personnel change will recommend a new Director and/or Associate Director to the Deans representing the College of Business and Behavioral Sciences and the College of Engineering and Science and to the Vice President for Research for approval.

The initial appointments of the Director and Associate Director will each be at most for one-quarter FTE on a calendar year basis, where one Full-Time Equivalent is defined by Clemson University as 12 credit hours. Funds for release time and salary of the Director, Associate Director and Staff will be derived either from the home academic department or through overhead that is returned on grant or contract research generated by the institute's faculty. Table II, shown below, substantiates expected institute support for personnel.

**Table II**

<b>UNIT ADMINISTRATION/FACULTY/STAFF SUPPORT</b>						
<b>YEAR</b>	<b>NEW</b>		<b>EXISTING</b>		<b>TOTAL</b>	
	Headcount	FTE	Headcount	FTE	Headcount	FTE
<b>Administration</b>						
2011 – 12	0	0	2	.5	2	.5
2012 – 13	0	0	2	.5	2	.5
2013 – 14	0	0	2	.75	2	.75
2014 – 15	0	0	2	.75	2	.75
2015 – 16	0	0	2	.75	2	.75
<b>Faculty</b>						
2011 – 12	0	0	23	0	23	0
2012 – 13	1	.25	23	0	24	.25
2013 – 14	0	0	24	.25	24	.25
2014 – 15	1	.25	24	.25	25	.5
2015 – 16	0	0	25	.5	25	.5
<b>Staff</b>						
2011 – 12	1	.5	0	0	1	.5

2012 – 13	0	0	0	0	1	.5
2013 – 14	0	0	1	.5	1	.5
2014 – 15	0	0	1	1.0	1	1.0
2015 – 16	0	0	1	1.0	1	1.0

**VI. PHYSICAL PLANT**

Space for HFE Institute personnel and infrastructure (including equipment purchased under sponsored programs) will be housed in space allocated to individual faculty members by their respective academic departments or in multi-investigator space allocated to the HFE Institute by Clemson University.

**VII. EQUIPMENT**

Institute supported equipment will be available to nonparticipating faculty, departments, and organizations for a fee, set at the University level, that reflects the costs of operation, maintenance, and upgrade.

**VIII. LIBRARY RESOURCES**

The library resources already existing on campus will be sufficient for the operation of the Institute and its projects.

**IX. ACCREDITATION, APPROVAL, LICENSURE, OR CERTIFICATION**

Not applicable. However, Clemson University’s Department of Psychology is fully accredited by the Human Factors and Ergonomics Society

**X. ESTIMATED COSTS AND SOURCES OF FINANCING**

New costs and financing are expressed in Table III. The estimate for faculty salary is based on an Associate Professor’s salary of \$81,000. Annual increases of 3% are included. Costs will be incurred only if the funding source is identified and approved. HFE Institute research will be self-sustaining through research grants, contract research services, and indirect funds generated on sponsored programs.

**Table III**

<b>ESTIMATED COSTS BY YEAR</b>						
<b>CATEGORY</b>	<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>TOTALS</b>
Program Administration	0	0	0	0	0	0
Faculty Salaries	30,000	30,900	31,827	32,782	33,766	159,275
Graduate Assistants	0	0	0	0	0	0
Clerical/Support Personnel	15,000	15,450	15,914	32,400	33,372	112,136
Supplies and Materials	1,000	2,255	4,569	5,000	5,000	17,824
Library Resources	0	0	0	0	0	0
Equipment	2,500	5,000	7,500	10,000	10,000	35,000
Facilities	0	0	0	0	0	0
Travel	7,500	9,000	12,000	15,000	15,000	58,500
<b>TOTALS</b>	<b>56,000</b>	<b>62,605</b>	<b>71,810</b>	<b>95,182</b>	<b>97,138</b>	<b>382,735</b>
<b>SOURCES OF FINANCING BY YEAR</b>						
Tuition Funding	0	0	0	0	0	0
Program-Specific Fees	0	0	0	0	0	0
State Funding*	0	0	0	0	0	0
Reallocation of Existing Funds; Department level cost-share	34,125	34,125	34,125	34,125	34,125	170,625
Reallocation of Existing Funds; College level support commitment	30,000	30,000	30,000	30,000	30,000	150,000
Indirect grant returns from research activities (self-generated by Institute Associates)	23,500	31,255	41,569	55,287	73,532	225,143
<b>TOTALS</b>	<b>87,625</b>	<b>95,380</b>	<b>105,694</b>	<b>119,412</b>	<b>137,657</b>	<b>545,768</b>

\* Special legislative appropriations to support the program.

## **XI. INSTITUTIONAL APPROVAL**

Department Chairs, Departments of Psychology and Industrial Engineering;  
July 9, 2008

Deans, College of Business and Behavioral Sciences and the College of  
Engineering and Science; July 9, 2008

President, Clemson University; November 1, 2008

Board of Trustees, Clemson University; October 17, 2008