Proposal for a
Ph.D. Program in
Applied Cognitive Science and Human Factors

Summary

This is a formal proposal to establish a Doctor of Philosophy degree in Applied Cognitive Science & Human Factors in the Department of Cognitive and Learning Sciences at Michigan Technological University. The proposed program will help meet strong demand for Human Factors professionals, will build on Michigan Tech’s existing strengths in science and technology, and will enable MTU to develop a nationally recognized program in an emerging discipline critical to technology. This document provides the rationale for, and details about the program.

Applied Cognitive Science - Human Factors

Applied cognitive science addresses a diverse array of contemporary human phenomena, resulting in practical solutions for many real world problems. Through the application of cognitive psychology’s principles, applied cognitive scientists investigate diverse topics such as effective modes for the delivery of instruction, eyewitness memory, artificial intelligence, and human factors considerations in the design of systems.

Human Factors (HF) is the multi-disciplinary science within the purview of cognitive science that focuses on the needs of the human in the design of products, work processes, and technology systems in an effort to optimize human well-being and overall system performance. HF is concerned with the design and evaluation of technological systems from the perspectives of human needs, abilities, and limitations. HF professionals may examine human-machine interactions from cognitive, social, biological, physical, or other perspectives.

From an Applied Cognitive Science perspective, Human Factors is involved in conducting research regarding human cognitive abilities and limitations with respect to the design, operation, or use of products or systems. It is a subfield of applied cognitive science that focuses upon human-machine interactions. Overall goals include optimizing human performance, health, safety, and/or habitability. Thus, the proposed program in Applied Cognitive Science and Human Factors will integrate the knowledge of human experts (psychology and cognitive science) and built systems experts (for example, technology and engineering).

Human Factors is a critical area of research because of (a) human safety concerns, (b) market forces, and (c) environmental sustainability. Human operators are often critical contributors to lapses in overall system safety. Human errors, for example, have been attributed as the cause of up to 98,000 preventable patient deaths a year in US medical practice. Despite our desire for automated, faultless systems, our current technological knowledge is not capable of foolproof technological fixes to problems of human error. Substantial funding has been allocated to research on machine intelligence, pattern-recognition technologies, and expert systems, but there
is only one alternative for many complex systems: human operators. Although they have limitations, humans are excellent pattern recognizers and, unlike current automated systems, are immensely flexible. HF is concerned with understanding human abilities and limitations, information critical to the prevention of human-related errors and the preservation of human life and well-being.

Critical to understanding market forces, HF researchers are motivated to assess customer needs and desires in order to increase customer satisfaction by improving the usability of products. User-centered design is a widespread paradigm in information technology and consumer products. The success of a human factors perspective in improving customer satisfaction in these industries suggests wider application.

Human Factors is not only important for human safety, well-being, and the economy, but it is also a critical component in forming a sustainable society. Many environmental disasters, such as the Exxon Valdez incident, are due to poor HF design, task design, and working conditions. Good HF design not only prevents human casualties, it also prevents environmental catastrophes. In addition, HF leads to better consumer products. Customers will discard poorly-designed products as they seek products they can actually use. Throwing away products because of poor user design is not a sustainable practice. Therefore, HF design is sustainable design.

There is increasing need for personnel trained in Human Factors in industry, government, and academia. According to the US Dept. of Labor Occupational Outlook handbook (2008-09 edition), employment for all psychologists (including all specialty areas) is expected to grow 15 percent from 2006 to 2016, faster than the average for all occupations. Further, they state “Job prospects should be the best for people who have a doctoral degree from a leading university in an applied specialty…Psychologists with extensive training in quantitative research methods and computer science may have a competitive edge…” A survey of three doctoral programs in Human Factors revealed that 90-95% of their graduates have secured positions prior to graduation, and 99% obtained employment after graduation, typically in the exact sub-discipline they desired. Clearly, Human Factors is a growth field with immense potential that offers great career opportunities. Moreover, salaries for human factors specialists are the highest among all subfields within psychology and cognitive science. According to a 2005 salary survey conducted by the Human Factors and Ergonomics Society, the mean annual base salary is approximately $92K for a master’s level profession and $105K for persons holding a doctorate. Doctoral-level consultants are reported as earning an average of $175K annually.

Opportunities exist and are expanding in all major employer groups: government, not-for-profit institutions, consulting firms, private industry, and academic institutions. Work settings range from classroom, to laboratory, to the industrial design team. Applied Experimental and Engineering Psychology is increasingly employed in litigation involving product and workplace safety. Salaries are competitive with those of engineers and other professionals who work in similar settings. In industry, there has been explosive growth in the HF job market with the development of increasingly complicated consumer products, network-centric business (electronic commerce), and more stringent product liability laws. With new technology, businesses are increasingly capable of customizing products for individual users. Jobs in this area of industry are often titled cognitive engineer, customer experience specialists, ergonomists,
human factors engineer, knowledge engineer, usability specialist, usability engineer, user experience specialist, and/or user interface designer. There has also been a surge of employment in the government sector for personnel trained in HF. For example, employment opportunities exist in the Department of Defense, Department of Homeland Security, Federal Aviation Administration, National Aeronautic and Space Agency, transportation, and intelligence services. The military, for example, has a number of career tracks for Ph.D.-level HF specialists, including the US Navy’s aviation experimental psychologist, surface research psychologist, and subsurface research psychologist, the US Army’s research psychologist, and the US Air Force’s aerospace research physiologist. In terms of government support, the Department of Defense’s broad agency announcements consistently identify HF research as one of the most critical areas of research. HF careers are also available in academia, in particular in psychology, which is currently the second largest undergraduate major in the United States, and in interdisciplinary programs housed in colleges of engineering, science, and medicine.

**Rationale**

This graduate program focuses on the application of cognitive science to understanding human use of and interaction with technology. The Human Factors interdisciplinary field builds upon psychology, engineering, and computer science/information technology. Emphasis is on using the methods and theories of cognitive science to create interventions designed to enhance safety and performance. Implementation of a graduate program in Human Factors is a key component in the development of a technological university. This facet, currently underdeveloped at Michigan Tech, builds upon existing strengths in the Department of Cognitive and Learning Sciences and in other academic units of the university, integrates behavioral science research with expertise in engineering and natural sciences, and is consistent with Michigan Tech’s current strategic plan to “offer programs in new and emerging areas, particularly interdisciplinary areas.” More specifically, the proposed program addresses the following areas of MTU’s strategic plan:

- **Goal 2:** Deliver a distinctive and rigorous discovery-based learning experience grounded in science, engineering, technology, sustainability, and the business of innovation.
  2.2 Develop undergraduate and graduate programs in new and emerging areas.

- **Goal 3:** Establish world-class research, scholarship and innovation in science, engineering, and technology that promotes sustainable economic development in Michigan and the nation.
  3.1 Increase interdisciplinary initiatives to expand knowledge and address societal needs.
  …develop and support superior graduate programs.

This program will contribute significantly to the goals of 500 enrolled Ph.D. students at the university by 2012, and the conferring of 60 Ph.D. degrees annually.

Michigan Tech faculty members possess considerable expertise in cognitive science and applied cognitive psychology and in science and engineering fields which study the interaction of human and technological systems. Current expertise in the Department of Cognitive and Learning
Sciences is in the areas of human memory, perception, attention, and cognition. Current research projects include work in human-robot interaction, interface design, multi-modal display design, data visualization, cognitive-perceptual performance assessment, transportation systems, computer automated systems, covert communication strategies, detection of deception (polygraph), human performance modeling, and STEM education. Affiliated faculty in the departments of Computer Science, Civil and Environmental Engineering, Electrical and Computer Engineering, Exercise Science, Health, and Physical Education, Mechanical Engineering-Engineering Mechanics, and Biomedical Engineering have expertise in human-computer interaction, simulations, robotics, biomechanics, and work physiology.

By integrating cognitive and HF psychologists and STEM education researchers with science and engineering faculty, this program merges cognitive science research with applications in a wide range of STEM fields. By combining faculty expertise in human subjects research with scientific and engineering expertise, the program will enhance interdisciplinary research at Michigan Tech and strengthen the university’s competitiveness on complex projects at the interface of human and technical systems.

This program responds to the national need to better understand how technological systems are limited by human operators. The modern world is increasingly being integrated with advanced, although very complicated, communication equipment. While this speeds up the pace of transactions, it also introduces new risks for designers who may make products unsuitable for the intended users. The business world is shifting to fast, lean, agile, just-in-time production methods. There will increasingly need to be a tight integration between usability-consumer research and manufacturing. Transportation systems are becoming more complex. Without seriously considering human operators and their limitations, modern society is setting itself up for catastrophic loses. Many disasters can be attributed to poor human-machine interaction or systemic design errors. Our graduates will be well prepared to rectify this situation, and the skills the program will provide are in very high demand by industry and government.

1. Program Description

The proposed program will be offered by the Department of Cognitive and Learning Sciences. Affiliated faculty in other academic units will also be directly involved as adjunct faculty in the program. The program provides a strong scientific basis in human subjects research and in the core areas of cognitive science necessary to skillfully undertake research on the interface of human behavior and technological systems. The program is a research-intensive curriculum, which includes a core in psychology and research methods. Students will select an area of specialization in which to focus their elective coursework and their dissertation research.

Course Requirements
The doctoral program in Applied Cognitive Science and Human Factors (ACSFH) will require a minimum of 72 credit hours. This consists of 32 hours from the core courses and required research, 30 hours of electives, and 10 dissertation research hours. Although most MTU Ph.D. programs require only 60 credits, nationally, most Human Factors and related programs require
between 80 and 90 credits. A sampling of such programs yielded an average of 83 credits
required. Likewise, many MTU programs have limited course requirements; however, Applied
Cognitive Science and Human Factors is a field in which students rarely have much
undergraduate preparation, so considerable work in basic subject matter is necessary to prepare
students to conduct appropriate research.

<table>
<thead>
<tr>
<th>Core Courses and Required Research (32 credits)*</th>
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<tbody>
<tr>
<td>PSY 5100  Applied Cognitive Science (3 hrs)</td>
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<tr>
<td>PSY 5850  Human Factors I (3 hrs)</td>
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<tr>
<td>PSY 5XXX  Human Factors II (3 hrs)</td>
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<tr>
<td>PSY 5XXX  Research Methods and Statistics (4 hrs)</td>
</tr>
<tr>
<td>PSY 5XXX  Advanced Statistical Analysis and Design (4 hrs)</td>
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<tr>
<td>PSY 5010  Cognitive Psychology (3 hrs)</td>
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<tr>
<td>PSY 5160  Sensation and Perception (3 hrs)</td>
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<tr>
<td>PSY 5060  Behavioral Neuroscience (3 hrs)</td>
</tr>
<tr>
<td>PSY 5998  Master’s Thesis I (3 hours)</td>
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<tr>
<td>PSY 5999  Master’s Thesis II (3 hours)</td>
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* Depending upon background of individual students, some of these courses may be waived.

<table>
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<th>Electives (30 credits)**</th>
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<tbody>
<tr>
<td>PSY 5XXX  Human Performance (3 hrs)</td>
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<tr>
<td>PSY 5XXX  Human-Computer Interaction (3 hrs)</td>
</tr>
<tr>
<td>PSY 5XXX  Usability Analysis (3 hrs)</td>
</tr>
<tr>
<td>PSY 5060  Behavioral Neuroscience (3 hrs)</td>
</tr>
<tr>
<td>PSY 5XXX  Ergonomics and Biomechanics (3 hrs)</td>
</tr>
<tr>
<td>ED 5510  Educational Technology (3 hrs)</td>
</tr>
<tr>
<td>PSY 5XXX  Supervised Teaching Practicum (3 hrs)</td>
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<tr>
<td>PSY 5XXX  Automation (3 hrs)</td>
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<tr>
<td>PSY 5XXX  Displays and Alarms (3 hrs)</td>
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<tr>
<td>PSY 5XXX  Independent Research (3 hrs)</td>
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<tr>
<td>PSY 5XXX  Current Issues in Human Factors (1-3 hrs)</td>
</tr>
<tr>
<td>PSY 5XXX  Special Topics in Cognitive Science (3 hrs)</td>
</tr>
<tr>
<td>PSY 5XXX  Special Topics in Human Factors (3 hrs)</td>
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</tbody>
</table>

** At least 9 credits must be from coursework; students will select courses in consultation with the advisor. Additional courses not listed here may be accepted as electives (see Section 7, Other Courses). Up to 21 credits of independent research may be applied towards the 30 required elective hours. A minimum of 9 elective hours must come from coursework, which comprises a student’s area of specialization within ACSHF.

<table>
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<tr>
<th>Dissertation (10 credit hours)</th>
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<tbody>
<tr>
<td>PSY 6999  Dissertation Research (10 hrs)</td>
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</tbody>
</table>

72 Credit Hours Total
Students who wish to terminate their studies after two years may acquire a M. S. degree by completing the core courses and six credits of required thesis research for a 32-credit master’s degree. Although students may earn a master’s degree en route, it is not our intention to admit students to a terminal master’s degree program.

2. Rationale

See pp. 2-4, above.

3. Related Programs at MTU and Elsewhere

The proposed Doctorate of Philosophy in Applied Cognitive Science and Human Factors will complement other programs at Michigan Tech and will be interdisciplinary in nature. There are no related programs at the university, although faculty in the Department of Cognitive and Learning Sciences has established a collaborative network for research in Human Factors with researchers in numerous science, engineering, and related departments. The Department of Cognitive and Learning Sciences offers a B.S. degree in Psychology.

There are no doctoral programs in Human Factors in Michigan. Central Michigan University offers a Ph.D. in applied experimental psychology, which potentially overlaps with Cognitive Science and Human Factors when applied to technological systems. Several Michigan universities offer graduate programs in Industrial Engineering or Industrial Design, somewhat related yet distinct disciplines that typically offer a single course pertaining to Human Factors. Michigan State University offers an interdisciplinary specialization in Cognitive Science, but not a degree.

In the upper Midwest, only the University of Minnesota-Twin Cities has a comparable degree program. They offer a graduate minor in Cognitive Science or in Human Factors for Ph.D. or M.A./M.S. programs. Additionally, they offer a Human Factors emphasis as part of their Kinesiology Ph.D. program.

The Human Factors and Ergonomics Society lists 120 graduate programs related to human factors in the Directory of Human Factors/Ergonomics Graduate Programs in the United States and Canada. Forty-three percent are doctoral programs, most of which are housed either in Industrial Engineering (41%) or Psychology (39%) departments. The remaining doctoral programs reside in departments such as Cognitive Science, Environmental Medicine, Design and Environmental Analysis, or Kinesiology; other programs are of an interdisciplinary nature and are housed in the graduate school. Of the Industrial Engineering programs, the majority (61%) offer concentrations through optional coursework rather than specific degrees in human factors or cognitive science.

Only two of MTU’s benchmark universities offer doctoral programs in Cognitive Science or Human Factors: Rensselaer (Cognitive Science) and Georgia Tech (Human Factors). Georgia
Tech offers a Human Factors concentration at the bachelor degree level. None of our benchmark universities offers an interdisciplinary program combining both fields.

4. Projected Enrollment

We anticipate that two students will enter the program by Fall, 2009. Thereafter, we expect 3 new students per year. Within 6-7 years the program will have between 12 and 15 students and an average of 3 new Ph.D. students will complete the program annually.

<table>
<thead>
<tr>
<th>HF Ph.D. Enrollment</th>
<th>2008-09</th>
<th>2009-10 (Year 1)</th>
<th>2010-11 (Year 2)</th>
<th>2011-12 (Year 3)</th>
<th>2012-13 (Year 4)</th>
<th>2013-14 (Year 5)</th>
<th>2014-15 (Year 6)</th>
<th>2015-16 (Year 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attrition = 25% &gt;yr.3</td>
<td>Planning &amp; Recruiting</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>New Students</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Returning Students</td>
<td></td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>10</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Total Enrollment</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>14</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Ph.D.s Awarded</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Three students will be supported as GTAs; ten students will be supported by external research funds; the remainder will be self-supported. External funding is anticipated to come primarily from US Department of Defense (see page 2), but also the National Science Foundation and National Institutes of Health. The result will be approximately two Ph.D. students per full-time graduate faculty member.

5. Scheduling Plans

The program will be a regular on-campus offering, with inception planned for Fall, 2009. The 2008-2009 academic year will be used for student recruiting. All core courses will be offered regularly (either annually or biennially), beginning Fall, 2009.

6. Curriculum Design

The core courses in the program (see Program Description, above) are designed to provide students, particularly from engineering and computer science, with fundamental understanding of human behavior, expertise in conducting research with human subjects, and an overview of the concepts, tools, and applications of Human Factors psychology. These eight core courses will be taken during the first 3 semesters in the program and will be taught by Cognitive and Learning Sciences faculty.
Areas of Specialization
Upon completion of the core courses, students will identify an area of specialization, from which they will select at least 18 credits to ensure sufficient depth and expertise to conduct dissertation research. Potential areas of specialization include the following:

- Human Performance
- Human-Computer Interaction
- Adaptive Automation/Biosensors
- Educational Technology
- Environmental Design
- Transportation/Geospatial Systems
- Manufacturing Systems
- Construction

Master’s Thesis
The master’s thesis should be completed during the second year. It is intended to help prepare students for doctoral level research. The thesis will be supervised by a committee comprised of three faculty members, at least one of which must be from the Department of Cognitive and Learning Sciences. At the end of the project, students are expected to present their research to the Department of Cognitive and Learning Sciences as both a written document and a public presentation/defense.

Comprehensive Exam
To obtain doctoral candidacy status, students must pass a comprehensive written examination. The candidacy exam is taken after all required courses and course-based electives are completed. The comprehensive exam must be passed within five years of starting the ACSHF program and at least two semesters prior to the dissertation defense. The exam will consist of four sections with questions covering the following topics: 1) applied cognitive science/cognitive psychology, 2) human factors/human performance, 3) research methodology/statistics, and 4) a specialty topic within ACSHF. Each section may contain multiple questions evaluating whether the student is capable of concept integration and application at the doctoral level. Questions for the first three sections will be provided by ACSHF faculty. A committee comprised of three faculty members of the student’s choosing will supply questions for the specialty area. The student’s answers will be graded by a minimum of two faculty members. Passage is required on all four sections to be considered a doctoral candidate. If a student fails one section, a remediation project to compensate for an area deficiency will be developed by relevant faculty in coordination with the student’s advisor. If a student fails two or more sections, the exam is considered failed en toto. The student must retake and pass the entire exam at the next scheduled administration. If a student fails to pass all sections of the exam upon retaking it, he/she will be expelled from the program.

Doctoral Dissertation

Dissertation Committee and Proposal Process
Once a student has doctoral candidacy status, he/she may officially form a dissertation committee. Students must submit a form signed by all committee members declaring the
make-up of the committee. Any changes to committee membership must be made in writing. The committee should have four members, two of whom must be faculty within the Department of Cognitive and Learning Sciences and one faculty member from outside the ACSHF Program. One committee member must be designated as the committee chair. Once the chair is satisfied with the student’s dissertation proposal, a proposal defense may be scheduled. The defense consists of an oral presentation before the committee. All committee members must sign-off on the proposal indicating their approval before the student may begin any data collection.

Oral Dissertation Defense
When the research is complete and the committee chair is satisfied with the manuscript, the student should send the dissertation to all other committee members to prepare for the defense. The dissertation defense is public, in that any member of the university committee may attend. The defense must be advertised a minimum of two weeks in advance of the scheduled defense date. All committee members must be present at the defense. After the defense presentation and a period of questioning from committee members, the committee will hold a private vote on two items. The first is whether the defense was passed (yea or nay). The second item is the status of the dissertation manuscript (accepted without revisions, accepted with minor revisions, or not accepted/needs extensive revisions).

7. New Course Descriptions
PSY 5XXX Human Factors II (3) – An overview of the tools and techniques used by human factors researchers and practitioners. Topics may include task analysis, link analysis, human error in systems, workload analysis, and physiological assessment techniques.

PSY 5XXX Advanced Statistical Analysis and Research Design I (4) – An overview of research ethics, experimental design, proposal writing, and univariate statistics.

PSY 5XXX Advanced Statistical Analysis and Research Design II (4) – A continuation of PSY 5XXX covering multivariate and nonparametric statistics.

PSY 5XXX Human Performance (3) – An overview of factors contributing to human performance in human-machine systems. Topics may include cognitive workload, attention, fatigue, aging, stress, and perceptual limitations.

PSY 5XXX Human-Computer Interaction (3) – An advanced course covering user-centered design of computer systems.

PSY 5XXX Usability Analysis (3) – An overview of the concepts and skills necessary for evaluating the intuitiveness of human-machine systems.
PSY 5XXX Ergonomics and Biomechanics (3) – An overview of the physical aspects of user-centered design. Specific topics may include anthropometry, repetitive strain injuries, and physical workload evaluation.

PSY 5XXX Automation (3) – An overview of the changing role of human users in automated systems. Topics may include levels of automation and factors contributing to human performance.

PSY 5XXX Displays and Alarms (3) – An overview of display and alarm display design principles for human-machine systems.

PSY 5XXX Independent Research (3) – TBD.

PSY 5XXX Current Issues in Human Factors (1) – An overview of the state of the field of human factors, trends, ethics for human factors practitioners, and career development.

PSY 5XXX Special Topics in Human Factors (3) – Study of special topics in human factors as designed by section title.

PSY 5XXX Special Topics in Cognitive Science (3) – Study of special topics in cognitive science as designed by section title.

PSY 5998 Research Project I (3) – Proposal and data collection phases of an independent research project.

PSY 5999 Research Project II (3) – A continuation of PSY 5998, analysis and public presentation of research results.

PSY 6999 Dissertation Research (10) – Fundamental and applied research in cognitive science and human factors psychology. Taken by doctoral students in partial fulfillment of the PhD research requirement.

**Other Courses** (catalog descriptions are in the Appendix)

PSY 5010  Cognitive Psychology
PSY 5100  Applied Cognitive Science
PSY 5060  Behavioral Neuroscience
PSY 5160  Sensation and Perception
PSY 5850  Human Factors I
BE 5110  Neuroengineering
BE 5700  Biosensors
BL 4470  Analysis of Biological Data
CE5404  Transportation Planning
CE 5410  Intelligent Transportation Systems
CS 4760  Human-Computer Interactions
CS 4811  Artificial Intelligence
8. Library and Other Learning Resources

Access to scholarly materials is absolutely essential at a research institution such as Michigan Tech, particularly for faculty mentoring doctoral students through high-quality, funded research. The Van Pelt library currently subscribes to 23 journals that are core to the Applied Cognitive Science and Human Factors program. In addition, the library has supporting journal holdings in engineering, computer science, exercise science, general psychology, and teacher education.

Enhancing our electronic database search engine PsychFirst is required. MTU currently offers database search access to psychology publications from only the preceding three years. Access to a more complete database and subscriptions to additional journals beyond our current holdings will be essential for both faculty and graduate students. This will require the availability of PsycINFO and PsycARTICLES.

Subscriptions to nine additional journals is essential to the program (see Appendix C). New library costs include (costs were estimated in consultation with Ellen Seidel):

- $3000.00 one-time allotment for the library to purchase core monographs in the area of cognitive and human factors psychology, allowing the purchase of approximately 90 hard and soft-cover items.
- $5782.00 for nine additional journals.
- $7200.00 (annual cost) provides full database search capability of the psychology literature (through PsycINFO in journal, book, and book chapter, and dissertation records, 1887–present, and PsycARTICLES records, 1988–present, to all faculty and students.

Additional Interlibrary loan costs will be generated for the library.
9. Computing Access Fee

Graduate students in the program will pay the standard Computing Access Fee to utilize the current undergraduate computing lab for Psychology majors.

10. Faculty Curriculum Vitae (vitae attached at end of document)

Cognitive & Learning Sciences Faculty:
Susan L. Amato-Henderson, Ph.D.
Associate Professor of Psychology
PhD, University of North Dakota
Psychology and law (eyewitness memory, credibility assessment, field sobriety testing); career and educational interests and decision making; self efficacy (your belief in your ability to do well in a given situation or setting); service learning as a teaching tool; outcome assessments; experimental design and statistical analysis

J. Christopher Brill, Ph.D.
Assistant Professor of Psychology, Cognitive & Learning Sciences
PhD, University of Central Florida
Tactile communication, mental workload, cognitive resource theory, multi-modal display and alarm design, spatial audio, human performance assessment, motion and simulator sickness, Sopite Syndrome (motion-induced drowsiness)

William S. Helton, Ph.D.
Assistant Professor, Department of Cognitive & Learning Sciences
PhD, University of Cincinnati
Engineering (human factors) psychology, environmental psychology, neurophysiological measures of cognition, psychometrics (stress and workload), skill acquisition in humans and working dogs

Kedmon N. Hungwe, Ph.D.
Assistant Professor, Cognitive & Learning Sciences
PhD, Michigan State University
Learning and development; educational policy & practice; educational media/technology

Rosalie P. Kern, Ph.D.
Associate Professor of Psychology, Department of Cognitive & Learning Sciences
PhD, Central Michigan University
Emotion, attention, and memory; decision making; perceptions of sexual harassment; psychology and law (trial consulting); experimental design and statistical analysis

Adjunct Faculty:
Jason Carter, Ph.D.
Chair & Assistant Professor of Exercise Science, Health and Physical Education
Adjunct Assistant Professor, Cognitive & Learning Sciences
Adjunct Assistant Professor, Biological Sciences
PhD, Michigan Technological University
Regulation of arterial blood pressure, the vestibulospinal reflex in humans, autonomic and cardiovascular adaptations to microgravity and exercise

Amlan Mukherjee, Ph. D.
Assistant Professor of Civil Engineering
Member, Michigan Tech Transportation Institute
Engineering-Environmental (inter-disciplinary program)
PhD, University of Washington
Planning and decision making in construction management using situational simulations, information visualization, transportation infrastructure management, simulations of complex systems, system dynamics, expert novice cognition (especially among construction managers)

Michele Miller, Ph.D.
Associate Professor of Mechanical Engineering
PhD, North Carolina State University
Precision engineering, microelectromechanical systems, engineering education

Michael Neumann, Ph.D.
Professor & Chair of Biomedical Engineering
Adjunct Professor of Electrical Engineering
PhD Case Institute of Technology, MD Case Western Reserve University
Biomedical instrumentation, biomedical sensors, microfabrication technology and perinatal medicine

Robert Pastel, Ph.D.
Assistant Professor, Computer Science
PhD, University of New Mexico
Human-computer interaction and human-robot interaction

Jindong Tan, Ph.D.
Assistant Professor of Electrical and Computer Engineering
PhD, Michigan State University
Computer engineering, mobile robotics

11. Available/Needed Equipment
Facilities

The department of Cognitive and Learning Sciences operates or has access to seven dedicated laboratories.

**Human-Robot Interaction Laboratory** in Advanced Technology Development Center equipped with unmanned aerial and ground robot vehicles, including 6 ground active-robots, 10 ground Romba robots (iRobot), and 2 remote-controlled helicopters, sensors (laser range finders,
sonar systems, visual capture systems), computers, and a wide-scale sensor network for environmental sensing.

**Virtual Reality Laboratory** in Rehki equipped with a GeoWall 3-d projection system, World Viz virtual reality system, magnetic and optical tracking equipment, head-up displays, computers, and interface equipment (joysticks, steering wheels, data-gloves).

**Human Fatigue and Vigilance Laboratory** in Chemical Sciences equipped with MindWare Technologies Biomedical Signal Processing Systems, Respironics Actigraphy System, Companion III Transcranial Doppler Sonography Unit, Seeing Machines Eye-tracker, Arrington Eye-tracker, and computers programmed with Superlab software.

**Multimodal Interface Laboratory** in Chemical Sciences equipped with a 24 Channel Vibrotactile Laboratory Display System, a 8 Channel Vibrotactile Laboratory Display System, a 8 Channel Wireless Vibrotactile Display System, and computer programmed with SuperLab software.

**Emotion and Memory Laboratory** in Chemical Sciences equipped with computers programmed with SuperLab software and other specialized programs.

**Detection of Deception Laboratory** in Chemical Sciences equipped with video recording equipment, computers, and a polygraph unit.

**Educational Technology Laboratory** in Academic Office Building equipped with computers, Vernier Software and Technology, including sensors for use with our Vernier interfaces.

No additional equipment will be necessary to initiate the program. Additional space needs are addressed below in Section 13.

**12. Program Costs**

Additional recurring costs are associated with implementation of this program (Appendix A). Three new graduate assistant lines to support teaching of introductory psychology courses will be necessary during the first five years of the program. New human factors faculty will be necessary to support existing faculty with undergraduate teaching obligations and to teach the required core courses in the program. New faculty should have expertise in the following areas:

- Applied Cognitive Science - Cognitive Ergonomics or Human-Computer Interaction
- Human Factors Psychology - Visual Performance and Display
- Quantitative Psychology; I/O Psychology: Simulation and Training or Team Performance

Two new faculty members will be needed when the program is initiated (Fall, 2009). The third faculty member (in Quantitative Psychology) will be added in the third year of the program, as externally funded research funds result in greater demands on the time of existing faculty.
Additional ongoing funds for library journals and online journal access will also be needed (see #8, above). The addition of these faculty members will enable the program to accommodate up to 15 students (approximately 2 Ph.D. students per full-time faculty member).

13. Space

Currently, each faculty member has an office and a 100 square foot room for research. The department also rents a 1000 square foot high bay facility for HF research. Other Human Factors programs typically provide approximately 1000 square feet of lab space per faculty member, with space increasing to nearly 2000 square feet for faculty with external funding. In addition, nearly all programs at other institutions have a dedicated teaching laboratory averaging 700 square feet (Appendix B).

We currently have 1438 square feet consisting of faculty offices, laboratories, a reception area, and a small conference room. This space is satisfactory for an undergraduate program with modest research activity, but additional space is essential if the program is to be successful. The Department of Cognitive and Learning Sciences has no excess space. New faculty will require office space and research facilities in order to carry out their research and scholarship obligations. Graduate students will also need office space. Without additional space, the Ph.D. program cannot be implemented. We are requesting approximately 10,000 square feet of space. A breakdown of this space request is provided in the table below:

<table>
<thead>
<tr>
<th>Allocated Use</th>
<th>Approximate Size (Sq Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Faculty Offices (144 sq ft each)</td>
<td>1008</td>
</tr>
<tr>
<td>7 Laboratory Suites (1000 sq ft each)</td>
<td>7000</td>
</tr>
<tr>
<td>2 GTA Offices (250 sq ft each; 2-3 students in each)</td>
<td>500</td>
</tr>
<tr>
<td>Reception/Common Area</td>
<td>400</td>
</tr>
<tr>
<td>Seminar/Conference Room</td>
<td>500</td>
</tr>
<tr>
<td>Graduate Teaching Laboratory</td>
<td>600</td>
</tr>
<tr>
<td><strong>Total:</strong>                                         <strong>10,008</strong></td>
<td></td>
</tr>
</tbody>
</table>

14. Policies, Regulations and Rules

No additional policies, regulations, or rules beyond those mandated by the Graduate School.

15. Accreditation Requirements

Accreditation is not necessary for this program.
16. Internal Status of Proposal

Dept. of Cognitive & Learning Sciences, ______________, Date Approved ______
Dean, College of Sciences and Arts, ______________, Date Approved ______
Provost, ______________, Date Approved ______
Graduate Faculty Council ______________, Date Approved ______
University Support Units, ______________, Date Approved ______
University Senate, ______________, Date Approved ______
Academic Affairs Officers, ______________, Date Approved ______
Board of Control, ______________, Date Approved ______

17. Planned Implementation Date

Fall, 2008, for planning, faculty recruiting, and student recruiting. First students begin Fall, 2009.
APPENDIX A  Costs and Revenue

Program Costs

One-time start-up costs:
- Marketing and Recruiting  $10,000
- Library monographs  $3,000

Total one-time costs  $13,000

Continuing costs:

Beginning Year 1 (2009-10)
- New faculty (salary + fringes)  $164,000
- New journals  $5,782
- Library online search  $7,000
- Graduate assistantships (2)  $40,000

Beginning Year 2
- Graduate assistantship (1)  $20,000

Beginning Year 3
- New faculty (salary & fringes)  $82,000

Total annual costs, as of 2011-12  $319,000

Program Revenue

Continuing revenue:

Beginning Year 1 (2009-10)
- External research funding  $75,000
- By Year 5 (2013-14, with 8 CLS faculty)  $300,000
- Indirect cost return  $168,000

Part-time instructional costs assumed by GTAs  $27,000

Total annual revenue, as of 2013-14  $327,000

By year three, the investment in the new program of about $300K annually (3 faculty lines and 3 GTA-ships) will result in an increase of external research funding by approximately the same amount. Enrollment in the program will have increased by three PhD students per year. By year five (2013-14), the program is projected to become revenue neutral, if not profitable. By year seven, the program will produce three PhD graduates annually, while remaining profitable.
## APPENDIX B  Space Needs

### Research Space Survey Summary

<table>
<thead>
<tr>
<th>Institution</th>
<th>Office Space per Faculty Member (Sq Ft)</th>
<th>Lab Rooms per Faculty Member</th>
<th>Lab Space per Faculty Member (Sq Ft)</th>
<th>Dedicated Teaching Lab (Sq Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univ. of Central Florida</td>
<td>144-180</td>
<td>1-3</td>
<td>420-700 (unfunded); increase to 1500-3500 for funded projects</td>
<td>2 labs, each with 45 computers (1972 sq ft total)</td>
</tr>
<tr>
<td>Old Dominion University</td>
<td>168-180</td>
<td>1-2</td>
<td>500-600 (unfunded); increase to 1500-2000 for funded projects</td>
<td>Info Not Available</td>
</tr>
<tr>
<td>Clemson Univ.</td>
<td>144-180</td>
<td>3-5</td>
<td>1000-2000 (regardless of funding)</td>
<td>Info Not Available</td>
</tr>
<tr>
<td>Univ. of Cincinnati</td>
<td>240-280</td>
<td>4-6</td>
<td>1000-2000 (regardless of funding)</td>
<td>1 lrg room 400 sq ft, plus 5-6 rooms 120 sq ft each (approx. 1000-1200 total)</td>
</tr>
<tr>
<td>Univ. of West Florida</td>
<td>144-180</td>
<td>1-3</td>
<td>400-600 (regardless of funding)</td>
<td>1200 sq ft</td>
</tr>
<tr>
<td>George Mason Univ.</td>
<td>300</td>
<td>1-3</td>
<td>200-400; plus shared lab spaces (e.g., simulation rooms, neuroergo testing)</td>
<td>500 sq ft</td>
</tr>
<tr>
<td>Virginia Tech</td>
<td>144</td>
<td>1-3</td>
<td>300-400 (regardless of funding), plus shared spaces</td>
<td>300 sq ft with 25 computers</td>
</tr>
<tr>
<td>Georgia Tech</td>
<td>360</td>
<td>3-6</td>
<td>1500-3000; plus shared spaces (regardless of funding)</td>
<td>800 sq ft with 30 computers</td>
</tr>
</tbody>
</table>

*Average for Institutions Surveyed: 226 Sq Ft 3 Rooms 1030 Sq Ft (unfunded); 1928 Sq Ft (with funding) 717 Sq Ft*
APPENDIX C  Library Holdings and Needs

Journals in J. R. Van Pelt Library
Accident Analysis and Prevention
Applied Cognitive Psychology
Applied Ergonomics
Behavioral and Brain Sciences
Cognition
Cognitive Psychology
Cognitive Science
Emotion
Ergonomics
Journal of Environmental Psychology
Journal of Experimental Psychology: Applied
Journal of Experimental Psychology: General
Journal of Experimental Psychology: Human Perception and Performance
Journal of Experimental Psychology: Learning, Memory and Cognition
Journal of Mind and Behavior
Journal of Occupational and Environmental Hygiene
Medicine and Science in Sports and Exercise
Memory and Cognition
National Academies in Focus / National Academy of Sciences
Physiology and Behavior
Psychological Bulletin
Psychological Science
Research Quarterly for Exercise and Sport

Journals Needed: Essential
Aviation Space & Environmental Medicine $215
Cognition and Emotion $1395
Human Computer Interaction $619
Human Factors $457
International Journal of Human-Computer Interaction $940
Perception and Psychophysics $365
Total $3991

Journals Needed: Important
International Journal of Aviation Psychology $645
Mind, Culture and Activity $375
Theoretical Issues in Ergonomics Science $771
Total $1791

Other Needs: Essential
Online Search Database $7000
Total $7000
Proposal for a Ph.D. Program in Applied Cognitive Science and Human Factors

Summary

This is a formal proposal to establish a Doctor of Philosophy degree in Applied Cognitive Science & Human Factors in the Department of Cognitive and Learning Sciences at Michigan Technological University. The proposed program will help meet strong demand for Human Factors professionals, will build on Michigan Tech’s existing strengths in science and technology, and will enable MTU to develop a nationally recognized program in an emerging discipline critical to technology. This document provides the rationale for, and details about the program.

Applied Cognitive Science - Human Factors

Applied cognitive science addresses a diverse array of contemporary human phenomena, resulting in practical solutions for many real world problems. Through the application of cognitive psychology’s principles, applied cognitive scientists investigate diverse topics such as effective modes for the delivery of instruction, eyewitness memory, artificial intelligence, and human factors considerations in the design of systems.

Human Factors (HF) is the multi-disciplinary science within the purview of cognitive science that focuses on the needs of the human in the design of products, work processes, and technology systems in an effort to optimize human well-being and overall system performance. HF is concerned with the design and evaluation of technological systems from the perspectives of human needs, abilities, and limitations. HF professionals may examine human-machine interactions from cognitive, social, biological, physical, or other perspectives.

From an Applied Cognitive Science perspective, Human Factors is involved in conducting research regarding human cognitive abilities and limitations with respect to the design, operation, or use of products or systems. It is a subfield of applied cognitive science that focuses upon human-machine interactions. Overall goals include optimizing human performance, health, safety, and/or habitability. Thus, the proposed program in Applied Cognitive Science and Human Factors will integrate the knowledge of human experts (psychology and cognitive science) and built systems experts (for example, technology and engineering).

Human Factors is a critical area of research because of (a) human safety concerns, (b) market forces, and (c) environmental sustainability. Human operators are often critical contributors to lapses in overall system safety. Human errors, for example, have been attributed as the cause of up to 98,000 preventable patient deaths a year in US medical practice. Despite our desire for automated, faultless systems, our current technological knowledge is not capable of foolproof technological fixes to problems of human error. Substantial funding has been allocated to research on machine intelligence, pattern-recognition technologies, and expert systems, but there
is only one alternative for many complex systems: human operators. Although they have limitations, humans are excellent pattern recognizers and, unlike current automated systems, are immensely flexible. HF is concerned with understanding human abilities and limitations, information critical to the prevention of human-related errors and the preservation of human life and well-being.

Critical to understanding market forces, HF researchers are motivated to assess customer needs and desires in order to increase customer satisfaction by improving the usability of products. User-centered design is a widespread paradigm in information technology and consumer products. The success of a human factors perspective in improving customer satisfaction in these industries suggests wider application.

Human Factors is not only important for human safety, well-being, and the economy, but it is also a critical component in forming a sustainable society. Many environmental disasters, such as the Exxon Valdez incident, are due to poor HF design, task design, and working conditions. Good HF design not only prevents human casualties, it also prevents environmental catastrophes. In addition, HF leads to better consumer products. Customers will discard poorly-designed products as they seek products they can actually use. Throwing away products because of poor user design is not a sustainable practice. Therefore, HF design is sustainable design.

There is increasing need for personnel trained in Human Factors in industry, government, and academia. According to the US Dept. of Labor Occupational Outlook handbook (2008-09 edition), employment for all psychologists (including all specialty areas) is expected to grow 15 percent from 2006 to 2016, faster than the average for all occupations. Further, they state “Job prospects should be the best for people who have a doctoral degree from a leading university in an applied specialty…Psychologists with extensive training in quantitative research methods and computer science may have a competitive edge…” A survey of three doctoral programs in Human Factors revealed that 90-95% of their graduates have secured positions prior to graduation, and 99% obtained employment after graduation, typically in the exact sub-discipline they desired. Clearly, Human Factors is a growth field with immense potential that offers great career opportunities. Moreover, salaries for human factors specialists are the highest among all subfields within psychology and cognitive science. According to a 2005 salary survey conducted by the Human Factors and Ergonomics Society, the mean annual base salary is approximately $92K for a master’s level profession and $105K for persons holding a doctorate. Doctoral-level consultants are reported as earning an average of $175K annually.

Opportunities exist and are expanding in all major employer groups: government, not-for-profit institutions, consulting firms, private industry, and academic institutions. Work settings range from classroom, to laboratory, to the industrial design team. Applied Experimental and Engineering Psychology is increasingly employed in litigation involving product and workplace safety. Salaries are competitive with those of engineers and other professionals who work in similar settings. In industry, there has been explosive growth in the HF job market with the development of increasingly complicated consumer products, network-centric business (electronic commerce), and more stringent product liability laws. With new technology, businesses are increasingly capable of customizing products for individual users. Jobs in this area of industry are often titled cognitive engineer, customer experience specialists, ergonomists,
human factors engineer, knowledge engineer, usability specialist, usability engineer, user experience specialist, and/or user interface designer. There has also been a surge of employment in the government sector for personnel trained in HF. For example, employment opportunities exist in the Department of Defense, Department of Homeland Security, Federal Aviation Administration, National Aeronautic and Space Agency, transportation, and intelligence services. The military, for example, has a number of career tracks for Ph.D.-level HF specialists, including the US Navy’s aviation experimental psychologist, surface research psychologist, and subsurface research psychologist, the US Army’s research psychologist, and the US Air Force’s aerospace research physiologist. In terms of government support, the Department of Defense’s broad agency announcements consistently identify HF research as one of the most critical areas of research. HF careers are also available in academia, in particular in psychology, which is currently the second largest undergraduate major in the United States, and in interdisciplinary programs housed in colleges of engineering, science, and medicine.

Rationale

This graduate program focuses on the application of cognitive science to understanding human use of and interaction with technology. The Human Factors interdisciplinary field builds upon psychology, engineering, and computer science/information technology. Emphasis is on using the methods and theories of cognitive science to create interventions designed to enhance safety and performance. Implementation of a graduate program in Human Factors is a key component in the development of a technological university. This facet, currently underdeveloped at Michigan Tech, builds upon existing strengths in the Department of Cognitive and Learning Sciences and in other academic units of the university, integrates behavioral science research with expertise in engineering and natural sciences, and is consistent with Michigan Tech’s current strategic plan to “offer programs in new and emerging areas, particularly interdisciplinary areas.” More specifically, the proposed program addresses the following areas of MTU’s strategic plan:

Goal 2: Deliver a distinctive and rigorous discovery-based learning experience grounded in science, engineering, technology, sustainability, and the business of innovation.
   2.2 Develop undergraduate and graduate programs in new and emerging areas.

Goal 3: Establish world-class research, scholarship and innovation in science, engineering, and technology that promotes sustainable economic development in Michigan and the nation.
   3.1 Increase interdisciplinary initiatives to expand knowledge and address societal needs.
   …develop and support superior graduate programs.

This program will contribute significantly to the goals of 500 enrolled Ph.D. students at the university by 2012, and the conferring of 60 Ph.D. degrees annually.

Michigan Tech faculty members possess considerable expertise in cognitive science and applied cognitive psychology and in science and engineering fields which study the interaction of human and technological systems. Current expertise in the Department of Cognitive and Learning
Sciences is in the areas of human memory, perception, attention, and cognition. Current research projects include work in human-robot interaction, interface design, multi-modal display design, data visualization, cognitive-perceptual performance assessment, transportation systems, computer automated systems, covert communication strategies, detection of deception (polygraph), human performance modeling, and STEM education. Affiliated faculty in the departments of Computer Science, Civil and Environmental Engineering, Electrical and Computer Engineering, Exercise Science, Health, and Physical Education, Mechanical Engineering-Engineering Mechanics, and Biomedical Engineering have expertise in human-computer interaction, simulations, robotics, biomechanics, and work physiology.

By integrating cognitive and HF psychologists and STEM education researchers with science and engineering faculty, this program merges cognitive science research with applications in a wide range of STEM fields. By combining faculty expertise in human subjects research with scientific and engineering expertise, the program will enhance interdisciplinary research at Michigan Tech and strengthen the university’s competitiveness on complex projects at the interface of human and technical systems.

This program responds to the national need to better understand how technological systems are limited by human operators. The modern world is increasingly being integrated with advanced, although very complicated, communication equipment. While this speeds up the pace of transactions, it also introduces new risks for designers who may make products unsuitable for the intended users. The business world is shifting to fast, lean, agile, just-in-time production methods. There will increasingly need to be a tight integration between usability-consumer research and manufacturing. Transportation systems are becoming more complex. Without seriously considering human operators and their limitations, modern society is setting itself up for catastrophic loses. Many disasters can be attributed to poor human-machine interaction or systemic design errors. Our graduates will be well prepared to rectify this situation, and the skills the program will provide are in very high demand by industry and government.

1. Program Description

The proposed program will be offered by the Department of Cognitive and Learning Sciences. Affiliated faculty in other academic units will also be directly involved as adjunct faculty in the program. The program provides a strong scientific basis in human subjects research and in the core areas of cognitive science necessary to skillfully undertake research on the interface of human behavior and technological systems. The program is a research-intensive curriculum, which includes a core in psychology and research methods. Students will select an area of specialization in which to focus their elective coursework and their dissertation research.

Course Requirements

The doctoral program in Applied Cognitive Science and Human Factors (ACSHF) will require a minimum of 72 credit hours. This consists of 32 hours from the core courses and required research, 30 hours of electives, and 10 dissertation research hours. Although most MTU Ph.D. programs require only 60 credits, nationally, most Human Factors and related programs require
between 80 and 90 credits. A sampling of such programs yielded an average of 83 credits required. Likewise, many MTU programs have limited course requirements; however, Applied Cognitive Science and Human Factors is a field in which students rarely have much undergraduate preparation, so considerable work in basic subject matter is necessary to prepare students to conduct appropriate research.

**Core Courses and Required Research (32 credits)**

- PSY 5100  Applied Cognitive Science (3 hrs)
- PSY 5850  Human Factors I (3 hrs)
- PSY 5XXX  Human Factors II (3 hrs)
- PSY 5XXX  Research Methods and Statistics (4 hrs)
- PSY 5XXX  Advanced Statistical Analysis and Design (4 hrs)
- PSY 5010  Cognitive Psychology (3 hrs)
- PSY 5160  Sensation and Perception (3 hrs)
- PSY 5060  Behavioral Neuroscience (3 hrs)
- PSY 5998  Master’s Thesis I (3 hours)
- PSY 5999  Master’s Thesis II (3 hours)

*Depending upon background of individual students, some of these courses may be waived.

**Electives (30 credits)**

- PSY 5XXX  Human Performance (3 hrs)
- PSY 5XXX  Human-Computer Interaction (3 hrs)
- PSY 5XXX  Usability Analysis (3 hrs)
- PSY 5060  Behavioral Neuroscience (3 hrs)
- PSY 5XXX  Ergonomics and Biomechanics (3 hrs)
- ED 5510  Educational Technology (3 hrs)
- PSY 5XXX  Supervised Teaching Practicum (3 hrs)
- PSY 5XXX  Automation (3 hrs)
- PSY 5XXX  Displays and Alarms (3 hrs)
- PSY 5XXX  Independent Research (3 hrs)
- PSY 5XXX  Current Issues in Human Factors (1-3 hrs)
- PSY 5XXX  Special Topics in Cognitive Science (3 hrs)
- PSY 5XXX  Special Topics in Human Factors (3 hrs)

** At least 9 credits must be from coursework; students will select courses in consultation with the advisor. Additional courses not listed here may be accepted as electives (see Section 7, Other Courses). Up to 21 credits of independent research may be applied towards the 30 required elective hours. A minimum of 9 elective hours must come from coursework, which comprises a student’s area of specialization within ACSHF.

**Dissertation (10 credit hours)**

- PSY 6999  Dissertation Research (10 hrs)

**72 Credit Hours Total**
Students who wish to terminate their studies after two years may acquire a M. S. degree by completing the core courses and six credits of required thesis research for a 32-credit master’s degree. Although students may earn a master’s degree *en route*, it is not our intention to admit students to a terminal master’s degree program.

2. Rationale

See pp. 2-4, above.

3. Related Programs at MTU and Elsewhere

The proposed Doctorate of Philosophy in Applied Cognitive Science and Human Factors will complement other programs at Michigan Tech and will be interdisciplinary in nature. There are no related programs at the university, although faculty in the Department of Cognitive and Learning Sciences has established a collaborative network for research in Human Factors with researchers in numerous science, engineering, and related departments. The Department of Cognitive and Learning Sciences offers a B.S. degree in Psychology.

There are no doctoral programs in Human Factors in Michigan. Central Michigan University offers a Ph.D. in applied experimental psychology, which potentially overlaps with Cognitive Science and Human Factors when applied to technological systems. Several Michigan universities offer graduate programs in Industrial Engineering or Industrial Design, somewhat related yet distinct disciplines that typically offer a single course pertaining to Human Factors. Michigan State University offers an interdisciplinary specialization in Cognitive Science, but not a degree.

In the upper Midwest, only the University of Minnesota-Twin Cities has a comparable degree program. They offer a graduate minor in Cognitive Science or in Human Factors for Ph.D. or M.A./M.S. programs. Additionally, they offer a Human Factors emphasis as part of their Kinesiology Ph.D. program.

The Human Factors and Ergonomics Society lists 120 graduate programs related to human factors in the *Directory of Human Factors/Ergonomics Graduate Programs in the United States and Canada*. Forty-three percent are doctoral programs, most of which are housed either in Industrial Engineering (41%) or Psychology (39%) departments. The remaining doctoral programs reside in departments such as Cognitive Science, Environmental Medicine, Design and Environmental Analysis, or Kinesiology; other programs are of an interdisciplinary nature and are housed in the graduate school. Of the Industrial Engineering programs, the majority (61%) offer concentrations through optional coursework rather than specific degrees in human factors or cognitive science.

Only two of MTU’s benchmark universities offer doctoral programs in Cognitive Science or Human Factors: Rensselaer (Cognitive Science) and Georgia Tech (Human Factors). Georgia
Tech offers a Human Factors concentration at the bachelor degree level. None of our benchmark universities offers an interdisciplinary program combining both fields.

4. Projected Enrollment

We anticipate that two students will enter the program by Fall, 2009. Thereafter, we expect 3 new students per year. Within 6-7 years the program will have between 12 and 15 students and an average of 3 new Ph.D. students will complete the program annually.

<table>
<thead>
<tr>
<th>HF Ph.D. Enrollment</th>
<th>2008-09</th>
<th>2009-10 (Year 1)</th>
<th>2010-11 (Year 2)</th>
<th>2011-12 (Year 3)</th>
<th>2012-13 (Year 4)</th>
<th>2013-14 (Year 5)</th>
<th>2014-15 (Year 6)</th>
<th>2015-16 (Year 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attrition = 25% &gt;yr. 3 Planning &amp; Recruiting</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>New Students</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Returning Students</td>
<td></td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Total Enrollment</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>14</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Ph.D.s Awarded</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Three students will be supported as GTAs; ten students will be supported by external research funds; the remainder will be self-supported. External funding is anticipated to come primarily from US Department of Defense (see page 2), but also the National Science Foundation and National Institutes of Health. The result will be approximately two Ph.D. students per full-time graduate faculty member.

5. Scheduling Plans

The program will be a regular on-campus offering, with inception planned for Fall, 2009. The 2008-2009 academic year will be used for student recruiting. All core courses will be offered regularly (either annually or biennially), beginning Fall, 2009.

6. Curriculum Design

The core courses in the program (see Program Description, above) are designed to provide students, particularly from engineering and computer science, with fundamental understanding of human behavior, expertise in conducting research with human subjects, and an overview of the concepts, tools, and applications of Human Factors psychology. These eight core courses will be taken during the first 3 semesters in the program and will be taught by Cognitive and Learning Sciences faculty.
Areas of Specialization
Upon completion of the core courses, students will identify an area of specialization, from which they will select at least 18 credits to ensure sufficient depth and expertise to conduct dissertation research. Potential areas of specialization include the following:

- Human Performance
- Human-Computer Interaction
- Adaptive Automation/Biosensors
- Educational Technology
- Environmental Design
- Transportation/Geospatial Systems
- Manufacturing Systems
- Construction

Master’s Thesis
The master’s thesis should be completed during the second year. It is intended to help prepare students for doctoral level research. The thesis will be supervised by a committee comprised of three faculty members, at least one of which must be from the Department of Cognitive and Learning Sciences. At the end of the project, students are expected to present their research to the Department of Cognitive and Learning Sciences as both a written document and a public presentation/defense.

Comprehensive Exam
To obtain doctoral candidacy status, students must pass a comprehensive written examination. The candidacy exam is taken after all required courses and course-based electives are completed. The comprehensive exam must be passed within five years of starting the ACSHF program and at least two semesters prior to the dissertation defense. The exam will consist of four sections with questions covering the following topics: 1) applied cognitive science/cognitive psychology, 2) human factors/human performance, 3) research methodology/statistics, and 4) a specialty topic within ACSHF. Each section may contain multiple questions evaluating whether the student is capable of concept integration and application at the doctoral level. Questions for the first three sections will be provided by ACSHF faculty. A committee comprised of three faculty members of the student’s choosing will supply questions for the specialty area. The student’s answers will be graded by a minimum of two faculty members. Passage is required on all four sections to be considered a doctoral candidate. If a student fails one section, a remediation project to compensate for an area deficiency will be developed by relevant faculty in coordination with the student’s advisor. If a student fails two or more sections, the exam is considered failed en toto. The student must retake and pass the entire exam at the next scheduled administration. If a student fails to pass all sections of the exam upon retaking it, he/she will be expelled from the program.

Doctoral Dissertation

Dissertation Committee and Proposal Process
Once a student has doctoral candidacy status, he/she may officially form a dissertation committee. Students must submit a form signed by all committee members declaring the
make-up of the committee. Any changes to committee membership must be made in writing. The committee should have four members, two of whom must be faculty within the Department of Cognitive and Learning Sciences and one faculty member from outside the ACSHF Program. One committee member must be designated as the committee chair. Once the chair is satisfied with the student’s dissertation proposal, a proposal defense may be scheduled. The defense consists of an oral presentation before the committee. All committee members must sign-off on the proposal indicating their approval before the student may begin any data collection.

**Oral Dissertation Defense**
When the research is complete and the committee chair is satisfied with the manuscript, the student should send the dissertation to all other committee members to prepare for the defense. The dissertation defense is public, in that any member of the university committee may attend. The defense must be advertised a minimum of two weeks in advance of the scheduled defense date. All committee members must be present at the defense. After the defense presentation and a period of questioning from committee members, the committee will hold a private vote on two items. The first is whether the defense was passed (yea or nay). The second item is the status of the dissertation manuscript (accepted without revisions, accepted with minor revisions, or not accepted/needs extensive revisions).

7. **New Course Descriptions**
PSY 5XXX Human Factors II (3) – An overview of the tools and techniques used by human factors researchers and practitioners. Topics may include task analysis, link analysis, human error in systems, workload analysis, and physiological assessment techniques.

PSY 5XXX Advanced Statistical Analysis and Research Design I (4) – An overview of research ethics, experimental design, proposal writing, and univariate statistics.

PSY 5XXX Advanced Statistical Analysis and Research Design II (4) – A continuation of PSY 5XXX covering multivariate and nonparametric statistics.

PSY 5XXX Human Performance (3) – An overview of factors contributing to human performance in human-machine systems. Topics may include cognitive workload, attention, fatigue, aging, stress, and perceptual limitations.

PSY 5XXX Human-Computer Interaction (3) – An advanced course covering user-centered design of computer systems.

PSY 5XXX Usability Analysis (3) – An overview of the concepts and skills necessary for evaluating the intuitiveness of human-machine systems.
PSY 5XXX Ergonomics and Biomechanics (3) – An overview of the physical aspects of user-centered design. Specific topics may include anthropometry, repetitive strain injuries, and physical workload evaluation.

PSY 5XXX Automation (3) – An overview of the changing role of human users in automated systems. Topics may include levels of automation and factors contributing to human performance.

PSY 5XXX Displays and Alarms (3) – An overview of display and alarm display design principles for human-machine systems.

PSY 5XXX Independent Research (3) – TBD.

PSY 5XXX Current Issues in Human Factors (1) – An overview of the state of the field of human factors, trends, ethics for human factors practitioners, and career development.

PSY 5XXX Special Topics in Human Factors (3) – Study of special topics in human factors as designed by section title.

PSY 5XXX Special Topics in Cognitive Science (3) – Study of special topics in cognitive science as designed by section title.

PSY 5998 Research Project I (3) – Proposal and data collection phases of an independent research project.

PSY 5999 Research Project II (3) – A continuation of PSY 5998, analysis and public presentation of research results.

PSY 6999 Dissertation Research (10) – Fundamental and applied research in cognitive science and human factors psychology. Taken by doctoral students in partial fulfillment of the PhD research requirement.

Other Courses (catalog descriptions are in the Appendix)

PSY 5010  Cognitive Psychology
PSY 5100  Applied Cognitive Science
PSY 5060  Behavioral Neuroscience
PSY 5160  Sensation and Perception
PSY 5850  Human Factors I
BE 5110  Neuroengineering
BE 5700  Biosensors
BL 4470  Analysis of Biological Data
CE5404  Transportation Planning
CE 5410  Intelligent Transportation Systems
CS 4760  Human-Computer Interactions
CS 4811  Artificial Intelligence
8. Library and Other Learning Resources

Access to scholarly materials is absolutely essential at a research institution such as Michigan Tech, particularly for faculty mentoring doctoral students through high-quality, funded research. The Van Pelt library currently subscribes to 23 journals that are core to the Applied Cognitive Science and Human Factors program. In addition, the library has supporting journal holdings in engineering, computer science, exercise science, general psychology, and teacher education.

Enhancing our electronic database search engine PsychFirst is required. MTU currently offers database search access to psychology publications from only the preceding three years. Access to a more complete database and subscriptions to additional journals beyond our current holdings will be essential for both faculty and graduate students. This will require the availability of PsycINFO and PsycARTICLES.

Subscriptions to nine additional journals is essential to the program (see Appendix C). New library costs include (costs were estimated in consultation with Ellen Seidel):

- $3000.00 one-time allotment for the library to purchase core monographs in the area of cognitive and human factors psychology, allowing the purchase of approximately 90 hard and soft-cover items.
- $5782.00 for nine additional journals.
- $7200.00 (annual cost) provides full database search capability of the psychology literature (through PsycINFO in journal, book, and book chapter, and dissertation records, 1887–present, and PsycARTICLES records, 1988–present, to all faculty and students.

Additional Interlibrary loan costs will be generated for the library.
9. Computing Access Fee

Graduate students in the program will pay the standard Computing Access Fee to utilize the current undergraduate computing lab for Psychology majors.

10. Faculty Curriculum Vitae (vitae attached at end of document)

Cognitive & Learning Sciences Faculty:
Susan L. Amato-Henderson, Ph.D.
Associate Professor of Psychology
PhD, University of North Dakota
Psychology and law (eyewitness memory, credibility assessment, field sobriety testing); career and educational interests and decision making; self efficacy (your belief in your ability to do well in a given situation or setting); service learning as a teaching tool; outcome assessments; experimental design and statistical analysis

J. Christopher Brill, Ph.D.
Assistant Professor of Psychology, Cognitive & Learning Sciences
PhD, University of Central Florida
Tactile communication, mental workload, cognitive resource theory, multi-modal display and alarm design, spatial audio, human performance assessment, motion and simulator sickness, Sopite Syndrome (motion-induced drowsiness)

William S. Helton, Ph.D.
Assistant Professor, Department of Cognitive & Learning Sciences
PhD, University of Cincinnati
Engineering (human factors) psychology, environmental psychology, neurophysiological measures of cognition, psychometrics (stress and workload), skill acquisition in humans and working dogs

Kedmon N. Hungwe, Ph.D.
Assistant Professor, Cognitive & Learning Sciences
PhD, Michigan State University
Learning and development; educational policy & practice; educational media/technology
Rosalie P. Kern, Ph.D.
Associate Professor of Psychology, Department of Cognitive & Learning Sciences
PhD, Central Michigan University
Emotion, attention, and memory; decision making; perceptions of sexual harassment; psychology and law (trial consulting); experimental design and statistical analysis

Adjunct Faculty:
Jason Carter, Ph.D.
Chair & Assistant Professor of Exercise Science, Health and Physical Education
Adjunct Assistant Professor, Cognitive & Learning Sciences
Adjunct Assistant Professor, Biological Sciences
PhD, Michigan Technological University
Regulation of arterial blood pressure, the vestibulosympathetic reflex in humans, autonomic and cardiovascular adaptations to microgravity and exercise

Amlan Mukherjee, Ph. D.
Assistant Professor of Civil Engineering
Member, Michigan Tech Transportation Institute
Engineering-Environmental (inter-disciplinary program)
PhD, University of Washington
Planning and decision making in construction management using situational simulations, information visualization, transportation infrastructure management, simulations of complex systems, system dynamics, expert novice cognition (especially among construction managers)

Michele Miller, Ph.D.
Associate Professor of Mechanical Engineering
PhD, North Carolina State University
Precision engineering, microelectromechanical systems, engineering education

Michael Neumann, Ph.D.
Professor & Chair of Biomedical Engineering
Adjunct Professor of Electrical Engineering
PhD Case Institute of Technology, MD Case Western Reserve University
Biomedical instrumentation, biomedical sensors, microfabrication technology and perinatal medicine

Robert Pastel, Ph.D.
Assistant Professor, Computer Science
PhD, University of New Mexico
Human-computer interaction and human-robot interaction

Jindong Tan, Ph.D.
Assistant Professor of Electrical and Computer Engineering
PhD, Michigan State University
Computer engineering, mobile robotics

11. Available/Needed Equipment
Facilities

The department of Cognitive and Learning Sciences operates or has access to seven dedicated laboratories.

**Human-Robot Interaction Laboratory** in Advanced Technology Development Center equipped with unmanned aerial and ground robot vehicles, including 6 ground active-robots, 10 ground Romba robots (Irobot), and 2 remote-controlled helicopters, sensors (laser range finders,
sonar systems, visual capture systems), computers, and a wide-scale sensor network for environmental sensing.

**Virtual Reality Laboratory** in Rehki equipped with a GeoWall 3-d projection system, World Viz virtual reality system, magnetic and optical tracking equipment, head-up displays, computers, and interface equipment (joysticks, steering wheels, data-gloves).

**Human Fatigue and Vigilance Laboratory** in Chemical Sciences equipped with MindWare Technologies Biomedical Signal Processing Systems, Respironics Actigraphy System, Companion III Transcranial Doppler Sonography Unit, Seeing Machines Eye-tracker, Arrington Eye-tracker, and computers programmed with Superlab software.

**Multimodal Interface Laboratory** in Chemical Sciences equipped with a 24 Channel Vibrotactile Laboratory Display System, a 8 Channel Vibrotactile Laboratory Display System, a 8 Channel Wireless Vibrotactile Display System, and computer programmed with SuperLab software.

**Emotion and Memory Laboratory** in Chemical Sciences equipped with computers programmed with SuperLab software and other specialized programs.

**Detection of Deception Laboratory** in Chemical Sciences equipped with video recording equipment, computers, and a polygraph unit.

**Educational Technology Laboratory** in Academic Office Building equipped with computers, Vernier Software and Technology, including sensors for use with our Vernier interfaces.

No additional equipment will be necessary to initiate the program. Additional space needs are addressed below in Section 13.

12. Program Costs

Additional recurring costs are associated with implementation of this program (Appendix A). Three new graduate assistant lines to support teaching of introductory psychology courses will be necessary during the first five years of the program. New human factors faculty will be necessary to support existing faculty with undergraduate teaching obligations and to teach the required core courses in the program. New faculty should have expertise in the following areas:

Applied Cognitive Science - Cognitive Ergonomics or Human-Computer Interaction  
Human Factors Psychology - Visual Performance and Display  
Quantitative Psychology; I/O Psychology: Simulation and Training or Team Performance

Two new faculty members will be needed when the program is initiated (Fall, 2009). The third faculty member (in Quantitative Psychology) will be added in the third year of the program, as externally funded research funds result in greater demands on the time of existing faculty.
Additional ongoing funds for library journals and online journal access will also be needed (see #8, above). The addition of these faculty members will enable the program to accommodate up to 15 students (approximately 2 Ph.D. students per full-time faculty member).

13. Space

Currently, each faculty member has an office and a 100 square foot room for research. The department also rents a 1000 square foot high bay facility for HF research. Other Human Factors programs typically provide approximately 1000 square feet of lab space per faculty member, with space increasing to nearly 2000 square feet for faculty with external funding. In addition, nearly all programs at other institutions have a dedicated teaching laboratory averaging 700 square feet (Appendix B).

We currently have 1438 square feet consisting of faculty offices, laboratories, a reception area, and a small conference room. This space is satisfactory for an undergraduate program with modest research activity, but additional space is essential if the program is to be successful. The Department of Cognitive and Learning Sciences has no excess space. New faculty will require office space and research facilities in order to carry out their research and scholarship obligations. Graduate students will also need office space. Without additional space, the Ph.D. program cannot be implemented. We are requesting approximately 10,000 square feet of space. A breakdown of this space request is provided in the table below:

<table>
<thead>
<tr>
<th>Allocated Use</th>
<th>Approximate Size (Sq Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Faculty Offices (144 sq ft each)</td>
<td>1008</td>
</tr>
<tr>
<td>7 Laboratory Suites (1000 sq ft each)</td>
<td>7000</td>
</tr>
<tr>
<td>2 GTA Offices (250 sq ft each; 2-3 students in each)</td>
<td>500</td>
</tr>
<tr>
<td>Reception/Common Area</td>
<td>400</td>
</tr>
<tr>
<td>Seminar/Conference Room</td>
<td>500</td>
</tr>
<tr>
<td>Graduate Teaching Laboratory</td>
<td>600</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>10,008</strong></td>
</tr>
</tbody>
</table>

14. Policies, Regulations and Rules

No additional policies, regulations, or rules beyond those mandated by the Graduate School.

15. Accreditation Requirements

Accreditation is not necessary for this program.
16. Internal Status of Proposal

Dept. of Cognitive & Learning Sciences, ________________, Date Approved ______
Dean, College of Sciences and Arts, ________________, Date Approved ______
Provost, ________________________, Date Approved ______
Graduate Faculty Council, ________________, Date Approved ______
University Support Units, ________________, Date Approved ______
University Senate, ________________, Date Approved ______
Academic Affairs Officers, ________________, Date Approved ______
Board of Control, ________________, Date Approved ______

17. Planned Implementation Date

Fall, 2008, for planning, faculty recruiting, and student recruiting. First students begin Fall, 2009.
APPENDIX A Costs and Revenue

Program Costs

One-time start-up costs:
- Marketing and Recruiting $10,000
- Library monographs $3,000

Total one-time costs $13,000

Continuing costs:
- Beginning Year 1 (2009-10)
  - New faculty (salary + fringes) $164,000
  - New journals $5,782
  - Library online search $7,000
  - Graduate assistantships (2) $40,000
- Beginning Year 2
  - Graduate assistantship (1) $20,000
- Beginning Year 3
  - New faculty (salary & fringes) $82,000

Total annual costs, as of 2011-12 $319,000

Program Revenue

Continuing revenue:
- Beginning Year 1 (2009-10)
  - External research funding $75,000
- By Year 5 (2013-14, with 8 CLS faculty) $300,000
  - Indirect cost return $168,000

Part-time instructional costs assumed by GTAs $27,000

Total annual revenue, as of 2013-14 $327,000

By year three, the investment in the new program of about $300K annually (3 faculty lines and 3 GTA-ships) will result in an increase of external research funding by approximately the same amount. Enrollment in the program will have increased by three PhD students per year. By year five (2013-14), the program is projected to become revenue neutral, if not profitable. By year seven, the program will produce three PhD graduates annually, while remaining profitable.
## Research Space Survey Summary

<table>
<thead>
<tr>
<th>Institution</th>
<th>Office Space per Faculty Member (Sq Ft)</th>
<th>Lab Rooms per Faculty Member</th>
<th>Lab Space per Faculty Member (Sq Ft)</th>
<th>Dedicated Teaching Lab (Sq Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univ. of Central Florida</td>
<td>144-180</td>
<td>1-3</td>
<td>420-700 (unfunded); increase to 1500-3500 for funded projects</td>
<td>2 labs, each with 45 computers (1972 sq ft total)</td>
</tr>
<tr>
<td>Old Dominion University</td>
<td>168-180</td>
<td>1-2</td>
<td>500-600 (unfunded); increase to 1500-2000 for funded projects</td>
<td>Info Not Available</td>
</tr>
<tr>
<td>Clemson Univ.</td>
<td>144-180</td>
<td>3-5</td>
<td>1000-2000 (regardless of funding)</td>
<td>Info Not Available</td>
</tr>
<tr>
<td>Univ. of Cincinnati</td>
<td>240-280</td>
<td>4-6</td>
<td>1000-2000 (regardless of funding)</td>
<td>1 lrg room 400 sq ft, plus 5-6 rooms 120 sq ft each (approx. 1000-1200 total)</td>
</tr>
<tr>
<td>Univ. of West Florida</td>
<td>144-180</td>
<td>1-3</td>
<td>400-600 (regardless of funding)</td>
<td>1200 sq ft</td>
</tr>
<tr>
<td>George Mason Univ.</td>
<td>300</td>
<td>1-3</td>
<td>200-400; plus shared lab spaces (e.g., simulation rooms, neuroergo testing)</td>
<td>500 sq ft</td>
</tr>
<tr>
<td>Virginia Tech</td>
<td>144</td>
<td>1-3</td>
<td>300-400 (regardless of funding), plus shared spaces</td>
<td>300 sq ft with 25 computers</td>
</tr>
<tr>
<td>Georgia Tech</td>
<td>360</td>
<td>3-6</td>
<td>1500-3000; plus shared spaces (regardless of funding)</td>
<td>800 sq ft with 30 computers</td>
</tr>
</tbody>
</table>

**Average for Institutions Surveyed:**

- Office Space: 226 Sq Ft
- Lab Rooms: 3 Rooms
- Lab Space: 1030 Sq Ft (unfunded); 1928 Sq Ft (with funding)
- Dedicated Teaching Lab: 717 Sq Ft
APPENDIX C  Library Holdings and Needs

Journals in J. R. Van Pelt Library
Accident Analysis and Prevention
Applied Cognitive Psychology
Applied Ergonomics
Behavioral and Brain Sciences
Cognition
Cognitive Psychology
Cognitive Science
Emotion
Ergonomics
Journal of Environmental Psychology
Journal of Experimental Psychology: Applied
Journal of Experimental Psychology: General
Journal of Experimental Psychology: Human Perception and Performance
Journal of Experimental Psychology: Learning, Memory and Cognition
Journal of Mind and Behavior
Journal of Occupational and Environmental Hygiene
Medicine and Science in Sports and Exercise
Memory and Cognition
National Academies in Focus / National Academy of Sciences
Physiology and Behavior
Psychological Bulletin
Psychological Science
Research Quarterly for Exercise and Sport

Journals Needed: Essential
Aviation Space & Environmental Medicine $215
Cognition and Emotion $1395
Human Computer Interaction $619
Human Factors $457
International Journal of Human-Computer Interaction $940
Perception and Psychophysics $365
Total $3991

Journals Needed: Important
International Journal of Aviation Psychology $645
Mind, Culture and Activity $375
Theoretical Issues in Ergonomics Science $771
Total $1791

Other Needs: Essential
Online Search Database $7000
Total $7000
William “Deak” S. Helton

Home Address
21725 Woodland Rd.
Houghton, MI 49931

Work Address
Michigan Technological University
Department of Psychology
1400 Townsend Drive
Houghton, MI 49931

E-mail: wshelton@mtu.edu
Phone: (906) 483-0326

E-mail: Deak_Helton@yahoo.com
Phone: (906) 487-4328

ACADEMIC EMPLOYMENT
2005 – Present  Assistant Professor of Psychology (tenure-track)
Michigan Technological University, Houghton, MI
2002 – 2005  Assistant Professor of Psychology (tenure-track)
Wilmington College, Wilmington, OH
2001 – 2002  Instructor of Experimental Design
Xavier University, Cincinnati, OH
2000 – 2002  Research Associate in Department of Psychology
University of Cincinnati, OH
1999 – 2000  Biostatistician
Cincinnati Children’s Hospital and Medical Center, OH
1995 – 1998  Research Assistant – Teaching Assistant
University of Cincinnati, OH

EDUCATION
2002  Ph.D. Human Factors Psychology
University of Cincinnati, OH
Dissertation: “Effects of Signal Salience and Noise on Performance and Stress in an Abbreviated Vigil”
Advisor: Joel S. Warm, Ph.D.
1998  M.A. Experimental Psychology
University of Cincinnati, OH
Thesis: “Optimism-Pessimism and False Failure Feedback: Effects on Vigilance Performance and Stress”
Advisor: William N. Dember, Ph.D.
1995  B.A. Philosophy & Mathematics
Evergreen State College, WA

CONSULTING
2003-2004  Statistician: Consulted for Clinton Memorial Hospital, Wilmington, OH
on projects funded by the U.S. Department of Health and Human Services.
2002-2003  Statistician: Consulted for the University of Cincinnati’s Department of Psychology on projects funded by a MURI Department of Defense grant.
2000-2002 Biostatistician: Consulted for Cincinnati Children’s Hospital and Medical Research Center, OH on projects funded by the National Institute of Health.

AWARDS & GRANTS

2007 Principal Investigator, US Air Force, Countermeasures to workload induced cognitive errors, pending.
2007 Co-Principal Investigator, Department of Education, Collaborative learning in construction management through situational simulations, with E. Rojas, C. Dossick and A. Mukherjee, Award: $436,512
2006 Co-Principal Investigator, Michigan Technological University Research Infrastructure Grant, A collaborative laboratory in immersive technology at Michigan Tech, with N. Hutzler, B. Baltensperger, J. Tan, and A. Mukherjee, Award: $50,000
2005 Principal Investigator, Century II Campaign Endowed Equipment Fund, Improving human factors education at Michigan Tech, Award: $6,000
2004 Principal Investigator, Wilmington College Faculty Research Grant, Dogs with jobs: attitudes towards canine workers Award: $2,000
2004 Southern Society for Philosophy and Psychology Griffith Prize
2004 Who’s Who Among America’s Teachers
2003 Who’s Who Among America’s Teachers
2003 Summer Fellowship, Deutscher Akademischer Austausch Dienst (DAAD), Munich, Germany
2003 Principal Investigator, Wilmington College Faculty Research Grant, Animal minds: changing environmental attitudes with Psychology Award: $1,000
2001 Student Travel Award, Southern Society for Philosophy and Psychology Award: $200
1997 Principal Investigator, Franciscan International Healthcare Grant, Post traumatic stress disorder among health-care workers in Zadar, Croatia Award: $3,400
1997 University Research Council Summer Fellowship, University of Cincinnati, OH

PROFESSIONAL MEMBERSHIPS

Member, Human Factors and Ergonomics Society; Member, Southern Society for Philosophy and Psychology; Member, North American Association of Environmental Education; Member, Midwestern Psychological Association
PUBLICATIONS


MANUSCRIPTS UNDER REVIEW


MANUSCRIPTS IN PREPARATION


REVIEWS


INVITED PRESENTATIONS

5. Helton, W.S. (2005, November). *Canine expertise*. Invited talk at the School of Forestry and Environmental Sciences, Michigan Technological University, Houghton, MI.


**REFEREED CONVENTION PRESENTATIONS**


PROFESSIONAL SERVICE

Chair of the Expertise Session at the 50th meeting of the Human Factors and Ergonomics Society, October 2006 San Francisco, CA
Chair of Evolutionary Computing and Fuzzy Systems Session at the 5th International Conference on Recent Advances in Soft Computing, December 2004 Nottingham, UK
Symposium Roundtable Participant, Special Meeting of the Ohio Psychological Association, June 2004 Columbus, OH
Chair of Methodological Problems and Prospects in Human Geography: Disaggregate Approaches Session at the Annual Convention of the Association of American Geographers, March 2002 Los Angeles, CA


ACADEMIC SERVICE & GOVERNANCE

Faculty Member of the Century II Fund Review Panel, 2007
Faculty Advisor for the Michigan Tech Psychology Club, 2006-present
Faculty Member of the Psychology Program Committee, Michigan Tech, 2006-present
Chair of the Psychology Faculty Search Committee, Michigan Tech, 2006-2007
Faculty Member of the Psychology Search Committee, Wilmington College, 2004-2005
Faculty Member of the Director of Institutional Research Search Committee, Wilmington College, 2003-2004
Faculty Advisor for the Wilmington College Psychology Club, 2003-2005
Faculty Member of the Affirmative Action Committee, Wilmington College, 2003-2005
Founder and Faculty Advisor for the Wilmington College Orienteering Club, 2002-2005
Faculty Member of the Social Science Evaluation Committee, Wilmington College, 2002-2003

GRADUATE STUDENT SUPERVISION

Kedar Gadgie, M.S. Thesis Committee, Civil Engineering
Huaming Li, Ph.D. Dissertation Committee, Electrical Engineering

COURSES TAUGHT
Michigan Technological University (Semester Courses)
Human Factors Psychology (2)
Behavioral Neuroscience (2)
Principles of Psychology (2)
Environmental Psychology (1)
Tools of Psychology (1)
History and Systems (1)
Research Methods (1)

Wilmington College (Semester Courses)
Introduction to Psychology (5)
Research Methods w/Descriptive Statistics (2)
Research Methods w/Inferential Statistics (6)
Motivation and Emotion (2)
Cognitive Psychology (1)
Personality (2)
Environmental Psychology (1)
Special Topic: Science and Pseudo-Science in Psychology (1)

Xavier University (Semester Courses)
Experimental Design (1)

University of Cincinnati (Quarter Courses)
Introduction to Psychology (6)
Research Methods (4)
Statistics (2)
CURRICULUM VITA

J. Christopher Brill
Michigan Technological University
1400 Townsend Road
Houghton, MI 49931
Office Phone: (906) 487-4329
E-mail: cbrill@mtu.edu

EDUCATION

2007  Doctorate of Philosophy – Applied Experimental and Human Factors Psychology
       University of Central Florida, Orlando

2003  Master of Arts – Industrial/Organizational Psychology
       University of West Florida, Pensacola
       Area of Concentration: Human Factors Psychology

1996  Bachelor of Arts – Psychology (Cum Laude)
       Northern Kentucky University, Highland Heights
       Minor: Music

1993  Associate of Arts – Liberal Arts (Magna Cum Laude)
       University of Cincinnati, Cincinnati, Ohio

CURRENT EMPLOYMENT

Michigan Technological University, Department of Cognitive & Learning Sciences (8/07 – Present)
Position: Assistant Professor of Psychology

RESEARCH EXPERIENCE

University of Central Florida, Psychology Department (8/01 – 05/07)
Position: Graduate Research Associate
Duties: Reviewing literature, writing progress reports, writing grant proposals, ordering and assembling laboratory equipment, collecting and analyzing data, managing fiscal expenditures, briefing sponsors and VIPs, and supervising undergraduate student assistants for a DARPA project involving the development of tactile display systems for dismounted soldiers. Additional work under a MURI grant involved developing a multi-modal (tactile, visual, and auditory) methodology for assessing reserve cognitive-perceptual capacities and workload.

Naval Aerospace Medical Research Laboratory (7/00 – 7/01)
Position: Research Associate (Contracted through Jackson Foundation for the Advancement of Military Medicine for a joint research project between NAMRL and Princeton University.)
Duties: Developing laboratory infrastructure, collecting and analyzing data, and writing reports for a project involving human ability to localize vibrotactile stimuli on the abdomen.
Naval Aerospace Medical Research Laboratory (1/00 – 7/00)
*Position:* Student Research Assistant
*Duties:* Developing measurement tools, training research team, collecting and analyzing data, and report writing on a project investigating the psychophysiological aftereffects of ship-deployed flight simulators.

University of West Florida (5/99 – 4/00)
*Position:* Graduate Research Assistant
*Duties:* Conducting literature review, developing measurement tools, collecting and analyzing data, and writing reports for a project investigating age-related biases in making causal attributions for mishaps.

TEACHING EXPERIENCE

University of Central Florida (8/04 – 8/07)
*Position:* Teaching Associate, Adjunct Instructor
*Duties:* Developing and teaching courses in Physiological Psychology, Sensation and Perception, Principles of Human Factors Psychology, Neuropsychology, and Cognitive Psychology. Supervising undergraduate students conducting directed research.

University of Central Florida (8/01 – 5/04)
*Position:* Graduate Teaching Assistant
*Duties:* Preparing in-class activities, coordinating study sessions, and generating and grading exams for courses in physiological psychology and research methods; guest lecturer for Advanced Sensation and Perception, Research Methods, Principles of Human Factors Psychology, and Advanced Human-Computer Interaction.

University of West Florida (8/99 – 4/00)
*Position:* Graduate Teaching Assistant
*Duties:* Presenting guest lectures, preparing activities, generating exams, and grading tests for courses in Industrial/Organizational Psychology, Human Factors Psychology, and Psychology of Learning.

Northern Kentucky University (5/95 – 5/96)
*Position:* Teaching Assistant
*Duties:* Preparing class materials, generating test items, and grading exams for Introduction to Psychology and Social Psychology. Also assisted with editing and writing portions of the instructor’s guide for the following books:

Northern Kentucky University (8/94 – 5/96)
*Position:* Academic Tutor
*Duties:* Tutoring individuals enrolled in psychology, statistics, and music classes.
FUNDED GRANTS


PUBLICATIONS

**DISSERTATION**


**THESIS**


**JOURNAL ARTICLES, BOOK CHAPTERS, AND INVITED MANUSCRIPTS**


CONFERENCE PROCEEDINGS PAPERS (REFEREED)


TECHNICAL REPORTS


CONFERENCE PRESENTATIONS, POSTERS, AND SYMPOSIA


**MISCELLANEOUS PUBLICATIONS**


**INVITED LECTURES**


**PATENTS AND DISCLOSURES**


PROFESSIONAL ACTIVITIES AND SERVICE

Ad Hoc Reviewer, Army Research Laboratory, Human Research and Engineering Directorate, 2007 – Present
Book Reviewer, Ergonomics and Design, 2004 – Present
Reviewer, Perception and Performance Technical Group, Human Factors and Ergonomics Society, 2005 – Present

MEMBERSHIPS AND AFFILIATIONS

Human Factors and Ergonomics Society, Member
   HFES Aerospace Systems Technical Group, Member
   HFES Perception and Performance Technical Group, Member
   HFES Education Technical Group, Member
Midwestern Psychological Association
Sigma Xi Scientific Research Society, Associate Member
Tactile Research Group, Member

HONORS, AWARDS, AND DISTINCTIONS

Human Factors and Ergonomics Society, Perception and Performance Technical Group, Best Student Poster Award, 2007
University of Central Florida, Research Fellowship, 2006
Human Factors and Ergonomics Society, Student-Member-with-Honors, 2005
Graduate Travel Fellowship, UCF Office of Graduate Studies, 2002, 2003
Sigma Xi Scientific Research Society, 1996
Omicron Delta Kappa National Leadership Society, 1996
Cincinnati Psychological Association Service Award, 1996
Northern Kentucky University Psychology Department Scholastic Excellence Award, 1996
EXCEL Leadership Society, 1995
Victoria Vincent Excellence in Research Award, Northern Kentucky University, 1995
Pi Kappa Lambda National Music Honor Society, 1994
Psi Chi National Honor Society in Psychology, 1994
University of Cincinnati, Academic Scholarship, 1991
Eagle Scout Award, Boy Scouts of America, 1988
OTHER EMPLOYMENT

Southeastern Psychological Association (SEPA) (9/98 – 7/00)
Position: Workshop Coordinator
Duties: Processing reservations, tracking and distributing continuing education unit certificates, balancing financial records, analyzing evaluation data, and writing reports.

Mental Health Association of Northern Kentucky (10/96 – 7/98)
Position: Representative Payee Program Coordinator, Case Manager
Duties: Coordinating the representative payee program, managing client finances, budget negotiation, writing reports, facilitating depression support group, case management, and presenting lectures for the Stigma Fighters Community Education Program.

OTHER ACTIVITIES

UCF Human Factors and Ergonomics Society Student Chapter, Secretary, 2002 – 04
Established and coordinated graduate student orientation program for University of West Florida psychology department, 1999 – 00
Psi Chi Psychology Honor Society, Vice President, 1995 – 96
Performed in multiple ensembles playing jazz and classical music, 1993 – 96
Vita
Rosalie P. Kern

Communication:
Department of Cognitive and Learning Sciences
310B Chemical Sciences Building
1400 Townsend Drive / Houghton, MI 49931-1295
Phone (906) 487-3571 / Fax: (906) 487-2468
E-mail rpkern@mtu.edu
Home: 1209 Front Street / Lake Linden, MI 49945
Phone: (906) 296-8054

Education

Ph.D.  2001    Central Michigan University
       Applied Experimental Psychology

M.S.   1998    Central Michigan University
       General Experimental Psychology

B.S.    1996    Central Michigan University
       Major: Psychology  Minors: Spanish, Latin American Studies

Employment and Experience

2001 – Present    Michigan Technological University
       Associate Professor of Psychology

1985-2001    Mid Michigan Community College
       Adjunct Instructor - Psychology & Spanish

1999    Carlton Trial Consulting & Research Center, Inc.
       Assistant Trial Consultant

1998    American Academy of Forensic Psychology
       Contemporary Issues in Forensic Psychology Workshop Series

Publications

Carter JR, Durocher JJ, Ray CA, and Kern RP.  Effects of Negative Pictures and Mental Stress on Neural and Cardiovascular Control in Humans.  Journal of Applied Physiology [In Progress]


**Presentations**


depends on the Measure of Emotion. Paper presented at the American Psychology -
Law Society Biennial Conference, Austin, Texas.

perception of sexual harassment. Poster session presented at the American
Psychology - Law Society Biennial Conference, Austin, Texas.

years in psychology and law. Poster session presented at the American
Psychology - Law Society Biennial Conference, Austin, Texas

at The 23rd Annual National Institute on the Teaching of Psychology, St.
Petersberg Beach, Florida.

of domestic violence on mock jurors’ sentencing decisions. Poster session
presented at the American Psychology-Law Society Biennial Conference, New
Orleans, LA.

Viger, S. G., Libkuman, T. M., Thomas [Kern], R. P., Otani, H., Bauer, S., Guzak, D.,
from the international affective picture system. Poster session presented at the
annual American Psychological Society Annual Convention, Miami, FL.

attention does not alter memory for arousing stimuli. Poster session presented at the
American Psychological Society Annual Convention, Denver, Colorado.

confound leads to improvement in background detail memory. Presented at the
American Psychological Society Annual Convention, Denver, Colorado.

memory for pictorial stimuli using a repeated testing paradigm. Presented at the
American Psychological Society Annual Convention, Washington, DC.

of errors on the Raven's Advanced Progressive Matrices. Presented at the
Cognitive Aging Conference, Atlanta, Georgia.

memory for emotional events. Presented at the American Psychological Society Annual
Convention, Washington, DC.

Monahan, J. S., & Thomas [Kern], R. P. (1996). Discovering perceptual structure:
Speeded classification and visual search. Presented at the 12th Annual Meeting of the
International Society for Psychonomics, Padova, Italy.

behaviors in university and community college settings. Paper presented at the
Liberal Arts Network for Development, Grand Rapids, MI


Current Research Projects

Kern, R. P.  Personality traits and perceptions of sexual harassment.

Kern, R. P.  Dimensions of negative affect.

Kern, R. P.  The effects of divided attention, valence, and sound, on memory for pictorial stimuli.


Professional Organization Membership

APA – American Psychological Association
APS – Association for Psychological Science
AP-LS - American Psychology and Law Society
SARMAC - Society for Applied Research in Memory and Cognition
SSPP - Southern Society for Philosophy and Psychology

Professional Service

Reviewer - Journal of Experimental Psychology, Learning, Memory, and Cognition
Editorial Board - Scientific Journals International
Peer Reviewer - Scientific Journals International
Referee - Distinguished Master's Thesis Committee
Referee - American Psychology - Law Society Biennial Conference
Conference Assistant Coordinator - Society for Applied Research in Memory and Cognition
Conference Session Chair - Society for Applied Research in Memory and Cognition

University Service

Faculty Senate Senator
Faculty Review Committee
Instructional Policy Committee Chair
University Assessment Committee
Executive Senate Committee
Thesis Committee – Jill Sajdyk, Humanities Dept.
Graduate School Dean Search Committee
Research Excellence Fund (REF) awards. - Reviewer
Advisory Board for Husky Game Development Enterprise Team
Graduate Faculty

College/Department Service

Promotion and Tenure Committees
Awards

Teaching Service Award - Institute of Electrical and Electronics Engineers
Who’s Who Among American Teachers

Instruction

2001 – Present  MTU – Assistant Professor
Principles of Psychology, Cross-Cultural Psychology, Psychology and
Law, Theories of Personality, Abnormal Psychology, Behavior
Modification, Cognitive Psychology, Developmental Psychology,
Independent Study, Directed Study in Teaching, Directed Study in
Research, Experimental Methods and Statistics I, Experimental Methods
and Statistics II.

1985-2001  Mid Michigan Community College
Adjunct Instructor - Psychology & Spanish
SUSAN AMATO-HENDERSON, PH.D.
CURRICULUM VITAE
JANUARY, 2008

Associate Professor of Psychology
Department of Education
Michigan Technological University
1400 Townsend Drive
Houghton, Michigan 49931

E-mail: slamato@mtu.edu
Voice: 906-487-2536
FAX: 906-487-2468

EDUCATION
Ph.D., Experimental Psychology, University of North Dakota, Grand Forks, ND., May, 1996

M.A., Psychology, University of North Dakota, Grand Forks, ND., December, 1993

B.S., Psychology, Northern Michigan University, Marquette, MI., May, 1991

PROFESSIONAL EMPLOYMENT
Associate Professor, Member of Graduate Faculty, Department of Cognitive and Learning Sciences, Michigan Technological University, Houghton, MI 49931, 2000 – present (Assistant Professor 2000 – 2006)


Lecturer, Canadian Police College, Polygraph Training Course, Ottawa, Ontario, Canada, 1999 - present
One week courses on Psychophysiology & Psychology as part of 14 week Polygraph training program for international law enforcement examiner trainees, mentoring of examiners upon completion of course.

Assistant Professor, Department of Psychology, Boise State University, Boise, ID 83725, 1996 – 2000

Courses taught: General Psychology, Theories of Learning, Statistics, Service Learning Courses

THESIS AND DISSERTATION


PROFESSIONAL MEMBERSHIPS
American Psychology-Law Society, APA Division 41
Midwestern Psychological Society
Psi Chi, National Honor Society in Psychology
AWARDS, GRANTS AND RESEARCH CONTRACTS

The Process of Learning Object Search, Selection, and Evaluation by STEM Teachers (PLOSSE), National Science Foundation, Co-Principal Investigator, $358,960, under review 2008

YES! Expo Assessment, 2007-2008, Dow Foundation, Principal Investigator, $10,000.

YES! Expo Assessment, 2006-2007, Dow Foundation, Principal Investigator, $4023.


RES-Research on Messages and Strategies to Increase Interest in Electrical, Computer, and Mechanical Engineering for Young Women, National Science Foundation-GSE, Co Principal Investigator, $500,000 (unfunded)


Recognition of Continued Dedication to the Polygraph Profession, Canadian Association of Police Polygraphists Region 5 & the Maine Polygraph Association, 2002

Recognition for Outstanding and Distinguished Service on the Psi Chi National Council, Rocky Mountain Regional Vice-President, 1999 – 2001

The Century II Campaign Endowed Equipment Grant (C2E2), MTU Internal Award for purchase of polygraph equipment, $3,075.00, 2001

Utah’s national Parks: Virtual-Learning in Geoscience Education, Consultant National Science Foundation, Assessment of cd-rom based education materials for earth science courses, J. Huntoon, Principal Investigator, Award Amount $429,000, 1998-2001

Effects of Various Pretest Procedures on the Validity of Comparison Question Tests, Dept. of Defense Polygraph Institute, Office of Naval Research, Co-Principal Investigator, $148,273.14 (Approved for funding, budget freeze prevented award allocation), 2000

Validity of Outside-Issue Questions in the Control Question Test, Dept. of Defense Polygraph Institute, Office of Naval Research, Co-Principal Investigator, $129,042, 1998 – 2000

Faculty Teaching Award, College of Social Sciences and Public Affair, Boise State Univ, 1999


Faculty Service Award, College of Social Sciences and Public Affairs, Boise State Univ, 1999
Faculty Research Associate Award, College of Social Sciences and Public Affairs and Office of Research Administration, Boise State University, 1999 – 2000

Undergraduate Research Initiative Awards, College of Social Sciences and Public Affairs, Boise State University, 1998, 1999


Effects of Misinformation of the Concealed Knowledge Test, Principal Investigator, Dissertation Research Award through PERSEREC, Office of Naval Research Department of Defense Polygraph Institute, Award Amount: $14,964, 1995 – 1996

PROFESSIONAL PUBLICATIONS

Student co-authors denoted with ∗


**PUBLISHED ABSTRACTS AND FINAL REPORTS**


**SCIENTIFIC PAPER PRESENTATIONS**

*Student co-authors denoted with *

SCIENTIFIC PAPER PRESENTATIONS, CONT.


SCIENTIFIC PAPER PRESENTATIONS, CONT.

Amato, S.L. (June, 2001). *Thriving in Graduate School: Professional Development.* Symposium presentation for the Annual Psi Chi Convention in conjunction with the Annual meeting of the American Psychological Society, Toronto.


SCIENTIFIC PAPER PRESENTATIONS, CONT.


Amato, S. (April, 1998). Field sobriety tests: (Mis)use of the horizontal gaze nystagmus test. Paper presented at the joint meeting of the Western and Rocky Mountain Psychological Associations, Albuquerque, NM.


SCIENTIFIC PAPER PRESENTATIONS, CONT.


SCIENTIFIC PAPER PRESENTATIONS, CONT.


SERVICE TO PROFESSION

Rocky Mountain Regional Vice President, Psi Chi, National Honor Society in Psychology, 1999 – 2001, Elected Member of National Council.

Psi Chi Steering Committee Member, Rocky Mountain Division, 1997 – 1999

Consultant, Pro-Bono, Certified Polygraph Examiners from Canada, United States, Belgium, United Kingdom, and other countries.

Pro-Bono Expert Witness for court cases -Eyewitness Memory and Field Sobriety Tests

Ad Hoc Editorial Consultant


The Journal of Credibility Assessment, 1998 - present

The Journal of Applied Cognitive Psychology, 2003
Text Book Reviewer
Introduction to Psychology, Santrock, 1998
Introduction to Psychology: The Adaptive Mind, Nairne, 1998
Psychology and Law, 1998

Grant Proposal Reviewer
Department of Defense, Research Award Proposal Reviewer, 2003, 2004
Psi Chi/Thelma Hunt Research Award, 1997, 1998
Psi Chi/APA Edwin B. Newman Graduate Research Award, 1997

 Psi Chi Chapter Advisor Research Grants, 1998
Psi Chi/ Allyn & Bacon Psychology Awards, 1997
Psi Chi Undergraduate Research Awards, 1999, 2000
Midwest Association of Graduate Schools Master's Thesis Competition, 2002

Program Review, Peer Review of Submissions
Western Psychological Association, 1998, 1999
Rocky Mountain Psychological Association, 1998 - 2001

Paper Session Chair, Rocky Mountain Psychological Association Meeting, 1997 – 2000

UNIVERSITY SERVICE
Human Subjects IRB Member, 2006
Michigan YES EXPO MTU steering committee (2004, 2005, 2006), creating the MTU display designed to attract students, especially females and other under-represented groups into STEM careers.
Michigan YES EXPO, MTU exhibit site co-coordinator, Chrysler Arena (Ann Arbor, MI, 2004), and Ford Field (Detroit, MI, 2005).
Director of Admissions Hiring Committee, 2005
Crisis Committee, 2005 - present
Mont Ripley Hiring Committee, 2005
Dean of Arts and Sciences Review Committee, 2003-2004
University Senate, 2003-2006
University Senate Curriculum Committee, 2003-2006
University Conflict of Interest Committee, 2002-2005
Mont Ripley Ski Hill Advisory Committee, 2001 - 2004
Benefits Liaison Committee, 2001 – 2003
MTU Assessment Council, 2001- 2002
Interim Director, Service Learning Program, Boise State University, January 2000 - 2001
Advisory Task Force Committee, Boise State University, 1996-1997
Faculty Development Committee, Boise State University, 1996-1998

DEPARTMENTAL SERVICE
Psychology Program Coordinator, 2003 – present
I developed the proposal for our Psychology Bachelor’s degree program, and served as the primary advocate for the proposal through all steps of approval (University Administration, senate, Board of Control, etc.) Once implemented, I developed all advising, marketing, and orientation materials. In support of the new major I have created many new courses and have worked closely with degree services, first year programs, admissions, etc. I have also attended numerous MTU recruiting events representing the psychology program.

Advisor, Psychology Club
Department of Education Library Liaison, 2001 - 2006
Department of Education Charter Committee, 2003-2004
Chair, Dept of Education Faculty Hiring Committee, 2000-2001, 2004-2005
Department of Education Chair Search Committee, 2000-2001
Department of Education Curriculum Committee, 2000-present
Master of Science in Applied Science Education Program committee, 2002 – 2004
Faculty Advisor, Psi Chi National Honor Society, Boise State University Chapter, 1996 – 2001

COMMUNITY SERVICE
Hancock Public Schools Foundation Executive Board Member, 2004 – 2005
Service-Learning Advisory Board, Copper Country Intermediate School Dist., 2004 - present
Victim Services Unit Inaugural Member, a collaborative program through Dial Help and the Houghton County Sheriff's Department, 2004 - 2006
President, Copper Country Alpine Ski Club, 2001-2004
Member, Copper Country Soccer Association Advisory Board, 2000-2001
Participant, Career Day, Calumet High School
Advisory Board Member, SANE Solutions (abuse offender and victim treatment providers), Boise, ID, 1997 – 2001
Coach, Lego League (Elementary School Robotics Group made it to the State Competition!)

SELECT INVITED ADDRESSES AND COMMUNITY PRESENTATIONS
Service Learning Across the Curriculum (Feb., 2006). Lunch and Learn Series, Center for Teaching, Learning, and Faculty Development, Michigan Tech University.

Psychology in Action (July, 2005, 2006). 1-week residential Summer Youth Program, Michigan Tech University, Houghton, MI.


Stress and Victim Services Providers (2005). Presentation during Dial Help staff training, Houghton, MI.

Secondary Education Preparation for a Bachelors degree in Psychology (2004). Presentation to the Western Upper Peninsula High School Counselors’ Roundtable, Hancock, MI.

Service Learning and the Proposed State of Michigan Volunteer Graduation Requirements (2004). Faculty professional development in-service, Hancock High School.

Psychopharmacology and the Polygraph (October 2002). Invited Feature Address to the Northwestern Region Polygraph Association Annual Meeting, Portland, Maine.

Child Development (September 2000 - 2003). Presentation given every semester to students enrolled in the Communicating Science course, Michigan Tech University, Houghton, MI.
Thinking Like a Child: Looking a Life through Junior's Eyes (November, 2000; January, 2000; November, 2001). Presentations given to BHK Child Care/Head-start Parent Groups, Hancock/South Range, MI.

Research On Polygraph Testing: Admissibility, Automation, And Contamination (December 1, 2000). Psychology Colloquium, Northern Michigan University, Marquette, MI.

WIC Client Satisfaction and Knowledge of the WIC Program. (May, 1999). Women, Infants and Children (WIC) Program Administration and Staff workshop, Boise, ID.


Public vs. Client Knowledge and Perceptions regarding the WIC Program. (March, 1999). Brown Bag Colloquium Series, Department of Psychology, Boise State University.


SELECT INVITED ADDRESSES AND COMMUNITY PRESENTATIONS, CONT.


Service-Learning (March & August, 1998). Faculty Workshop presentations, Co-presenter Rose Olson, Boise State University.

Subtle Sexual Abuse: Definitions, Opinions and Juror Ethnocentrism when Allegations of Abuse Arise. (March, 1998). Symposium organized and chaired by Susan Amato, presented during the biennial meeting of the American Psychology-Law Society (APA Division 41), Redondo Beach, CA.

Understanding the Effects of Misinformation of Memory. (March, 1996). Invited presentation at Northern Michigan University Colloquium, Department of Psychology, Marquette, MI.

The Effects of Misinformation as revealed through the Concealed Knowledge Test. (February 1996). Boise State University, Department of Psychology, Boise, ID.

Understanding the Effects of Misinformation on Memory and the Concealed Knowledge Test. (January, 1996). Invited presentation at the University of North Dakota Colloquium Series offered by the Department of Psychology, Grand Forks, ND.

SPECIALIZED TRAINING


CBA 103- School Finance and School Budget, School Board Member Training provided by the Michigan Association of School Boards, Lansing, MI (October, 2005)

KEDMON NYASHA HUNGWE  
VITA  
October, 2007  

PERSONAL BACKGROUND

206 Academic Office Building  
Michigan Technological University,  
1400 Townsend Dr.  
MI 49931  
khungwe@mtu.edu  

EDUCATIONAL HISTORY

Advisor: Dr. King Beach III. Dissertation topic: Becoming a machinist in a changing trade.


PROFESSIONAL WORK HISTORY

Michigan Technological University  
August 2002-  
present.  
Assistant Professor, Department of Cognitive and Learning Sciences, Division of Teacher Education.

University of Zimbabwe  
September 1987-  
April, 2002  
Senior Lecturer, Center for Educational Technology. 
(Lecturer, ’87-’92). Adjunct: Department of Teacher Education & Department of Curriculum Studies. I was on study leave at Michigan State from August 1992 to May 1997)

Michigan State University  
1993-1996  
Teaching/Research Assistant
Ministry of Education, Zimbabwe, Zimbabwe Secondary Schools Science Project. Jan 1984-June ‘85. Lecturer. The goal of the Zimbabwe Secondary Schools Science project was to provide a complete science course for four years of secondary education through the use of specially prepared teachers’ guides, students’ study guides, and comprehensive low-cost science kits. The work activities were 1) writing and revising texts; 2) Designing laboratory experiences; and 3) conducting in-service professional development courses for teachers.


RESEARCH ACTIVITY AND LIST OF PUBLICATIONS

Books


Instructional modules


Articles


**Book Chapters**


**Book reviews**


**Peer reviewed conference proceedings**


**Presentations (invited)**


Research websites (created and edited)

African cinema: reviews, criticism and theory (http://www.ed.mtu.edu/~khungwe/afrika/)

Current contents

By Kimani Gecau (Department of Media Studies, University of Zimbabwe)
- Mwanasikana: In Search of an Audience in Zimbabwe (research paper)

By Kedmon Hungwe
- Film-making in Central Africa (book review)
- Fifty years of film-making in Zimbabwe (research paper)
- Interview with Ben Zulu - African Movies and the Global Mainstream
- Interview with Michael Raeburn-Independent Filmmaker

By Martin Mhando (Media Studies, Murdoch University, Australia)
- Film review: Fogata
- Southern African Cinema: Towards a regional narration of the nation

Content Reviews


TEACHING EXPERIENCE

Undergraduate Teacher Education

Michigan Technological University (2002 - present)

Courses
- Fundamentals of Instruction (developed and taught)
- Psychological Foundations of Education
- Instructional Technology

University of Zimbabwe (1987—2002)

Courses
- The Development and Use of Texts: Focus on theoretical and practical skills for the local production of texts using microcomputers and related technologies (focus on elementary school education). (developed and taught)
- Learning and Development through Play and Information Technologies in Early Childhood Environments.
- Methods and Media in Instruction (developed and taught)

Michigan State University (Graduate Teaching Assistant) (Fall 1995-Fall 1996).
- Reflections on Learning

Graduate Teacher Education

Michigan Technological University (2002 - present)

Masters level teacher education
Co-created and co-taught the following online courses
- Science Education Research (co-developed and co-taught with Dr W. Yarroch)
- Science Learning Materials, Inquiry and Assessment (Co-developed with Drs W. Yarroch, M. Hindelang. Co-taught with Dr Yarroch)
- Connecting Michigan Science Benchmarks and Research. (Developed by Dr. W. Yarroch)

Ad hoc Professional development courses for teachers
These are one credit course offerings for teachers from across the state delivered through both face-to-face and distance education. Teachers engage in action research in their own classrooms.
- Special Content Studies
- Special Topics in Education

Graduate Student Advising
Currently advisor to 16 part-time teacher graduate students.
Four advisees have graduated. Their research projects are:
- Jennifer Toivonen. Using GIS and inquiry-based education to teach hominid evolution, 2004
- Melissa Maxson. Inquiry through teaching water quality, 2005
- Charles Schepke. A qualitative study using Michigan’s Keweenaw Peninsula’s paleomagnetic past as a resource for teaching secondary science, 2005
- Debra Zolynsky. Motivating students to become scientifically literate through inquiry, 2007

**University of Zimbabwe (1987-2002)**
Co-founding member, Center for Educational Technology. Co-developed the program and courses with Dr John Rwambiwa.

New Graduate Courses developed and taught
- *Computer literacy*: Computer literacy considered in historical perspective and in relation to other literacies (e.g. print and television literacy).
- *Educational Technology Foundations*: Theoretical ideas on learning and development, perception theories, and communication theories that inform the practice of Educational Technology.
- *Communication Technologies*: The educational impact of new technologies, and in particular satellite-based communication technologies and the internet.
- *Research Methods and Statistics*.

Other Graduate courses taught
- *Psychological Foundations of the Curriculum*: Psychological theories that have influenced curriculum planning, development and evaluation.
- *Methods and products of selected curriculum development projects in Zimbabwe*: Developed and taught course.
- *Use of computers in Educational Administration*: Developed and taught course.

Graduate Student Advising
Over thirty graduate student projects; several masters theses; one doctoral thesis as a co-advisor.

**RESEARCH GRANTS**

**Michigan Technological University (2002 - present)**

Externally Funded Grants
- PI (since Jan 2007) on *Removing Barriers to Success: Reducing Gender Differences in 3-D Spatial Skills*. National Science Foundation. Co-PIs Paul Charlesworth, Thomas Drummer (National Science Foundation ($499,534.00  (10/01/04 - 9/30/2008.). *Grant awarded with Sheryl Sorby as PI*.
- Co-PI on *Optimizing the Interdisciplinary Course: Introduction to Electrical Engineering (EE) for Non-EE Majors*. National Science Foundation: Principal Investigator Seyed Zekavat.
CO-PI(s) Kedmon Hungwe, Glen Archer, David Nelson, William Bulleit $462,398.00
(09/01/04-8/31-2008)

University of Zimbabwe (1987-2002)

Internally Funded Grants

- A study of the uses of computer technologies in schools. University of Zimbabwe Research Board 1988-1990 (~ US$6,000)
- Three travel grants to present papers at professional meetings in the United Kingdom & USA.

OTHER

Consultantships

- Department for International Development, United Kingdom, 2002.
- Adelphi University, Evaluation of Teacher-Leader quality program grant (formerly Dwight D. Eisenhower Grant), 2007

Visiting positions

- Michigan State University, Visiting Scholar (instructor), African Studies Center, Summer 2001.

SERVICE

Professional memberships and service

Current Memberships

- Michigan Science Teachers Association
- National Council of Teachers of Mathematics
- American Society for Engineering Education

Review of journal articles

- Journal for Research in Mathematics Education, Guest reviewer
- Journal of Psychology in Africa, Guest reviewer
- Journal of Women and Minorities in Science and Engineering, Guest reviewer

Review of conference papers

- American Educational Research Association Annual Conference (Division C - Learning and Instruction)
- IPSI BgD Transactions on Internet Research
University Service

Michigan Technological University (2002 - present)
- Assessment Council (since 2006).
- Graduate Faculty Council (2002-2005)
- Advisor: African Praise Fellowship (since 2005)

University of Zimbabwe (1987-2002)
- Faculty Higher Degree Research Committee, 1997-2002.
- Senate (1997-1999; 2001)

Service on examination boards (1987-2002)
- External member of the examination boards for the following teacher education colleges in Zimbabwe:
  - Gweru Teachers College, Mutare Teachers college, Seke Teachers College, Masvingo Teachers College; Hillside Teachers College; Belvedere Teachers’ College.

AWARDS & HONORS

Recipient of the RG Mugabe Fellowship, Center for African Studies, Michigan State University. One of three fellowships awarded to outstanding junior faculty from the University of Zimbabwe for advanced graduate studies at Michigan State University. The fellowship funded my PhD studies in Educational Psychology, 1992-1997. Tuition and living expenses.

Recipient of the W.B. & Candace Thoman Fellowship, 1994-95. Awarded to outstanding international scholars completing their doctoral studies who show achievement and promise in scholarship, leadership, and dedication to search for solutions to the problems of poverty and hunger. Program activities included volunteer work with 4-H clubs in Lansing, Michigan.

Recipient of a United States Agency for International Development fellowship. Awarded to outstanding young professionals from Zimbabwe to undertake advanced studies in the USA. I earned an MS in Curriculum and Instruction at the University of Wisconsin—Madison (1985-1987). Tuition and living expenses.


Phi Kappa Phi honor society, Michigan State University, 1995.

## BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed for Form Page 2. Photocopy this page or follow this format for each person.

### NAME
Michael R. Neuman

### POSITION TITLE
Professor of Biomedical Engineering and Chairman

### EDUCATION/TRAINING
( Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Institute of Technology</td>
<td>BSEE</td>
<td>1961</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Case Institute of Technology</td>
<td>MSEE</td>
<td>1963</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Case Institute of Technology</td>
<td>PhD</td>
<td>1966</td>
<td>Engineering</td>
</tr>
<tr>
<td>Case Western Reserve University School of Medicine</td>
<td>MD</td>
<td>1974</td>
<td>Medicine</td>
</tr>
</tbody>
</table>

### RESEARCH AND PROFESSIONAL EXPERIENCE:
Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles, all authors, and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. If the list of publications in the last three years exceeds two pages, select the most pertinent publications. DO NOT EXCEED TWO PAGES.

- June, 2003 - Professor and Chairman, Department of Biomedical Engineering, Michigan Technological University
- May, 1998 – July, 2003 Herff Professor of Biomedical Engineering, University of Memphis
- June 2000- July, 2003 Professor, Department of Pediatrics, University of Tennessee Health Science Center
- July, 1974 –1998 Associate Professor of Biomedical Engineering in Reproductive Biology, Case Western Reserve Univ.
- Feb. 1980 - Aug. 1980 Guest Professor, Universitatsspital Frauenklinik, Zurich, Switzerland
- July, 1970 - June, 1974 Associate Professor of Biomedical and Electrical Engineering, Case Western Reserve University
- Sept. 1966 - June, 1970 Assistant Professor of Engineering, Case Western Reserve

### PROFESSIONAL ACTIVITIES
- Editor, *Physiological Measurement*, 2002 -
- NIH-FDA Consensus Development Conference on Infant Apnea and Home Monitoring, 1986
- Program co-chairman, IEEE-EMBS International Meeting, Amsterdam, 1996.

### PUBLICATIONS
(160 Papers and book chapters; 228 abstracts and presentations; 5 patents)


Robert Pastel

M. S. Computer Science and Ph. D. Physics

SUMMARY
Over 10 years experience teaching computer science, physics and mathematics at the university and college level. Research in experimental computer science and physics.

TEACHING EXPERIENCE

Michigan Tech. University, Houghton, MI - CS Assistant Professor (2006-present)
Taught 3-6 credits per semester and conducted research in HCI computer science
- Human-computer Interaction: User centered design, undergraduate course
- Human-computer Interaction: Usability Testing, graduate course
- Introduction to Data Structure, undergraduate course

Michigan Tech. University, Houghton, MI - CS Lecturer (2001-05)
Taught 9-12 credits per semester and conducted research in HCI computer science.
- Introduction to Algorithms
- Human-computer Interaction
- Introduction to Data Structure
- Numerical Methods using Fortran
- Introductory Fortran

Michigan Tech. University, Houghton, MI - Visiting Assistant Professor (1997-2000)
Taught 9-12 credits per quarter and conducted research in optical physics.
- Calculus-based and Algebra-based Introductory Physics: Lecture and Recitation
- Calculus and Pre-calculus
- Senior Level Electrodynamics: Lecture and Recitation
- Senior Level Optics: Laboratory
- Junior Level Computers and Physics: Laboratory

Adams State College, Alamosa, CO - Visiting Instructor (1996-97)
Taught 12 credits per semester and conducted community service
- Junior Level Analogue and Digital Electronics: Lecture and Laboratory
- Algebra-based Introductory Physics: Lecture and Recitation
- Mechanical Drawing: Lecture and Laboratory
- Statics: Lecture and Recitation

Harford Community College, Aberdeen, MD - Adjunct Professor (1996)
- Introductory Astronomy

College of Santa Fe, Santa Fe, NM - Adjunct Instructor (1994-95)
- Introductory Programming: Lecture and Laboratory
- Introductory Computers: Lecture and Laboratory
EDUCATION

M. S. Computer Science  Describing VLIW Architectures Using a Domain Specific Language  Michigan Tech. University, 2001
Ph. D. Physics  Br* Laser and Quenching  University of New Mexico, 1994
M. S. Engineering Science  Aircraft Wing Vibration due to Atmospheric Turbulence  University of Tennessee, 1980
B. S. Mathematics  Virginia Polytechnic Inst., 1977

PUBLICATIONS

The Difficulty of Centering Circular Discs
Pastel, R.

Human factors education: bridges, barriers and the trolls under the bridges.

A Case Study in Canine-Human Factors: A Remote Scent Sampler for Landmine Detection
Helton, W, Begoske, S., Pastel, R., and Tan, J.

The Usability of Gravity Mouse
Pastel, R., Himes, P. and Harper, M.

The Difficulty of Remotely Negotiating Corners

RFID Cards: A New Deal for Elderly Accessibility
Pastel, R., C. Wallace, and J. Heines

A Tool for Enabling Scientific Exploration of Human Performance Models in HCI Education.
Schedlbauer, M.,and Pastel, R.,

Effects of Posture on Target Acquisition with a Trackball and Touch Screen
M. Schedlbauer, R. Pastel, and J. Heines
ITI’06, June 2006, Dubrovnik, Croatia, awarded best student paper

“Measuring the Difficulty of Steering Through Corners”
Pastel, R.
ACM CHI’06, p. 1087-1096, Montreal, Canada, April 24-28, 2006
Object-Action Association: A HCI Design Model
R. Pastel and N. Skalsky

Demonstrating Information in Simple Gestures
R. Pastel and N. Skalsky

Transportable Research Instrument: a PDA-based Laboratory for Science Experiments
N. Skalsky and R. Pastel

Measuring Evaporation Rates for Laser Trapped Droplets Using Morphology Dependent Resonances
R.L. Pastel and A. Struthers

Materials Aspects of Laser Guided Direct Writing
E.M. Nadgorny, R.L. Pastel, A.A. Struthers, and A. Miner

Laser Trapping of Microscopic Particles for Undergraduate Experiments
R.L. Pastel, A. Struthers, Ryan Ringle, J. Rogers, C. Rohde, and P. Geiser

Spectral Differentiation of trace Concentration by Laser Photofragmentation with Fragment Ionization at 226 nm and 456 nm: Quantive Analysis of NO-NO₂ Mixtures
R.L. Pastel, and R. Sausa

Laser Guidance and Trapping and transport of Microscopic Particles in Hollow-core Optical Fibers
M.J. Renn, R. L. Pastel and H. A. Lewandowski

Detection of NO and NO₂ by (2+2) Resonance Enhanced Multiphoton Ionization and Photoacoustic Spectroscopy
R. L. Pastel, and R. Sausa
Applied Optics, Vol. 35, N o.21, p. 4046

Detection of NO using Laser-Induced Photoacoustic Spectroscopy
C. Williamson, R. L. Pastel, and R. Sausa

Atomic Quenching of Br* by I and Br
Measurement of the 2-photon and 3-photon detachment for H⁻

Parametric Study of Longitudinally Pumped Br⁺ Laser

Efficient Br⁺ Laser Pumped by Frequency-doubled Nd:YAG and Electronic-to-Vibrational Transfer-pumped CO₂ and HCN Laser

Intra-cavity Doubling of a CO₂ TEA Laser with Thallium-arsenic-selenide Crystal
R. L. Pastel

Morphology-dependent Resonance at small size parameter
R.L. Pastel, R. Ringle, and M. Renn
QthD3, C.LEO/QUEL 1999
Baltimore, MD, May 1999

Direct Writing of Materials by Laser Guidance
M J. Renn and R.L. Pastel
CFC4, C.LEO/QUEL 1999
Baltimore, MD, May 1999

Laser Trapping of Crystallites in Hollow Optical Fibers
R. L. Pastel, and H. Lewandowski and M. Renn
PDL 14, Bulletin of the American Physical Society, Division of Atomic, Molecular, and Optical Physics, Vol. 43, No 3, Santa Fe, N.M. May 1998.

Laser Particle Manipulation and Surface Patterning by Laser Guidance
M J. Renn and R.L. Pastel
AM-4, Electron Ion Photon Beam Nanofabrication
Chicago, IL, June 1998

Trace Analysis of Ambient Nitrocompounds by using 452 nm Laser Photofragmentation/Fragment Detection Spectrometry
R. L. Pastel, and R. Sausa

Polarization and Intensity Effects on Multiphoton Detachment of H⁻ and H⁺

Polarization and Intensity Effects on Multiphoton Detachment of H⁻
Rapid Tuning Mechanism for CO$_2$ Lasers


Parallel Electric Fields and Anomalous Resistivity in Classical Penning Discharge

**R. L. Pastel**, J. R. Roth, and P. D. Spence

A Paired Comparison of High Frequency RF Emission from Two Configurations of Electric Field Dominated Plasma

J. R. Roth, P. W. Hayman, and **R. L. Pastel**

Axial Profile of Electrostatic Potential and Electron Number Density in a Classical Penning Discharge

**R. L. Pastel**, P. D. Spence, and J. R. Roth

A Paired Comparison of High Frequency RF Emission from Two Configurations of Electric Field Dominated Plasma

J. R. Roth, P. W. Hayman, and **R. L. Pastel**

Aircraft Wing Vibration due to Atmospheric Turbulence

**R. L. Pastel**, J. E. Caruthers, and W. Frost

Passive Q-Switching of CO$_2$ TEA Laser Using SF$_6$

**R. L. Pastel**

**INVITED TALKS**

Steering through Corners

**R. Pastel**
University of Massachusetts at Lowell
Lowell, MA, April 2006.

Laser Deposition and Trapping of Microscopic Particles

**R. Pastel**
Army Research Laboratory
Fort Aberdeen, May 1999.

Frequency Response of Laser Trapped Crystals in Hollow Optical Fibers

**R. Pastel**
Invited Talk, Michigan Technological University, Houghton, MI, March 1998

**PATENTS and DISCLOSURES**

Gravity Mouse: Technique for Assisting Target Acquisition using a Mouse

**R. Pastel**
Disclosure submitted to MTU IPO.
Transportable Research Instrument: PDA-based Laboratory (PBL) for Science Experimentation
N. Skalsky and R. Pastel
Provisional patent

Collaborative Learning
R. Pastel
Disclosure submitted to MTU IPO.

Laser-guided Manipulation of Non-atomic Particles
M. Renn, D. Odde, and R. Pastel

A Device and Process for Detecting and Discriminating NO and NO₂ from Nitrocompounds in real-time and in situ
R. Pastel, and R. C. Sausa

GRANTS and PENDING PROPOSALS

Pending
Enabling Email for Computer Users with Alzheimer’s Disease
PI: R. Pastel, Co-PI: C. Wallace, W. Helton
Alzheimer’s Association, 2007, $200,000

Graspable Interfaces: A scalable visual approach to HCI using RFID Cards
PI: R. Pastel, Co-PI: C. Wallace, W. Helton
National Science Foundation, 2007, $449,000

Funded
DURIP: Human-Robot Interaction Laboratory Equipment
Department of Defense, $467,017 (2007)

Enterprise: Set Top Box Discovery Project
PI: R. Pastel, Co-PI: Mary Raber, Rick Berky
T2 Communications LLC, 1/07-12/07, $15,000

Improving Human Factors Education at MTU
PI: W. S. Helton Co-PI: R. Pastel, M. Miller
MTU Century II Campaign Endowed Equipment, 11/30/06, $4,500

"Laser Direct Write Lithography for Electronic Circuits"
PI: M. Renn, Co-PI: R. Pastel, A. Struthers, and E. Nadgrony
DARPA MICE Subcontract funded at $300K

Declined
MRI: Development of a Robotic Hazard-mitigation and Urban Sensor Network Experimental Platform
PI: T. Jindong Co-PI: R. Pastel, M. C. Friedrich, W. S. Helton, Y. Li,
National Science Foundation, 7/01/07 - 7/01/09, ~ $250,000

Simulating Interest in IT Careers: Empowering Teachers to Make a Difference
National Science Foundation, 1/1/08 - 1/1/10, $1,168,238
HCC: Improving Computer Accessibility for the Elderly through Tangible User Interfaces
PI: R. Pastel Co-PI: C. Wallace, J. Heines
National Science Foundation, 8/20/07 - 8/19/10, $449,694

NSP ESI-ITEST: “Making a Difference with Computers: Engaging Women & Minorities”
proposed: $1,198,739 for 2006-9

RET Site: Engineering the Future - Enhancing Teacher Content Knowledge Through Research

Integrated Microsystems Enterprise: TRlcoder Project
PI: R. Pastel
National Collegiate Inventors and Innovators Alliance, 3/1/04 - 2/28/05, $19,399

BOOK REVIEWS and PUBLISHER SYMPOSIA

Data Structures & Their Algorithms, Darry R. Lewis and Larry Denenberg
Addison-Wesley

Seeing Is Believing, Hollie Endres
Red Brick Learning

Data Structure and Algorithms in Java 3/e, Michael Goodrich and Roberto Tamassia
Wiley

Symposium in Data Structure in Java, Chicago, June 16 - 18, 2004
McGraw-Dill Higher Education

Data Structures and the Java Collections Framework, William Collins
McGraw Hill

Software Design and Data Structures in Java, Koffman
Addison-Wesley

Data Structures and Other Objects Using Java, 2/e, Michael Main
Addison-Wesley

GRADUATE STUDENT ADVISING

Chris Brown, MS, MTU, Advisor 2007 - present
Jon Woods, MS, MTU, Advisor 2007- present
Keith Rutkowski, Ph.D., Advisor 2007-present

Chris Blazek, MS, MTU, Advisor 2005 – 2007
“A Field Study of Menu Selection and Number Entry in a Confidential Web Page”

Martin Schedbauer, Sc.D., UML, Committee member, 2005 - 2007
“An Empirical Derived Model for Predicting Completion Time of Cursor Positioning Task in Dual-talk Environments”

Abu Ashraf, MS, MTU, Committee member, 2005,
“Design and Use of Instruments for the Measurement of Software Usefulness”
UNDERGRADUATE RESEARCH STUDENTS
Brandyn Phelps, 2008
Arlo Moran, 2007
Jon Perich, 2007
Andy Spina, 2007
Joseph Ross 2006-07
Paul Himmes, 2004-2006
Jacob Champlin, 2005-06
Matt Harper, 2005-06
Nathan Paul, 2004-2006
N. Skalsky, 2004
Chris Balzek, 2003-05
Joseph Vailancourt, 2003
Peter Geiser, 1999
Charles Rohde, 1998-99
Ryan Ringle, 1998-99
H. Lewandowski, 1998

COMMUNITY SERVICE
Psychology Adjunct Professor, 2008-present
Faculty Advisor for Husky Game Enterprise, (informal) 2004-05 (formal) 2006-present.
Faculty Advisor for MTU Linux Users Group, 2002 - 2005.
Faculty Advisor for DDR social club, 2002 – 2006.
Faculty Advisor for Integrated Microsystems Enterprise, 2003.
Organized and Monitored Life Drawing Group, 1985-87.
Maintained Aircraft for UTSI Glider Club, 1983.
Scout Master, Tullahoma TN, 1977-78.
ART EXHIBITS AND THEATER PRODUCTIONS

"Too Jewish," Westside Theater, 43 St. & 9 Ave., NY, NY 9/95
Scenery design and painting

"Reckless," Rail Yard Performance Center, Santa Fe, N M 12/93
Scenery design and painting

Eli Levin 20th Anniversary Show, Raelian Studio, Albuquerque, N M 6/93
Gallery Realistic, Santa Fe, N M 5/93
Two pen and ink drawings

Blue Tarps Exhibition, Callnan Gallery, Albuquerque, N M 10/92
Two oil paintings

Outdoor Studio Exhibition, John Sommers Gallery, Albuquerque, N M 9/92
Two oil paintings

REFERENCES

Linda Ott, Chair and Professor
Computer Science Department
Michigan Technological University
Houghton, MI 49931
Phone: (906) 487-2209
linda@mtu.edu

Charles Wallace, Assistant Professor
Computer Science Department
Michigan Technological University
Houghton, MI 49931
Phone: (906) 487-3431
wallace@mtu.edu

Jesse Heines, Associate Professor
Computer Science Department
University of Massachusetts Lowell
Lowell, MA 01854
Phone (978) 934-3634
heines@cs.uml.edu
PROFESSIONAL SUMMARY

Dr. Mukherjee is an Assistant Professor in Civil and Environmental Engineering. He focuses his research and professional activities primarily in the area of planning and decision making in construction management and transportation infrastructure management. He conducts research on developing conceptual frameworks and implementing models that can aid decision makers assess alternatives and explore what-if scenarios. He combines research methods that involve the development and application of interactive simulations, life cycle cost and environmental analysis with advances in information technology. The goal is to collect and mine existing data in order to investigate and forecast behavior of civil infrastructure systems, and develop new methods and processes that support and enhance decision-making.

EDUCATION

UNIVERSITY OF WASHINGTON, SEATTLE
Doctorate of Philosophy in Civil Engineering, June, 2005

UNIVERSITY AT BUFFALO (SUNY)
Master of Science in Civil Engineering, August 2001

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, INDIA
Bachelor of Science in Civil Engineering, July 2000

APPOINTMENTS

MICHIGAN TECHNOLOGICAL UNIVERSITY, HOUGHTON, MI
Department of Civil and Environmental Engineering
2005-Present
Assistant Professor

UNIVERSITY OF WASHINGTON, SEATTLE, WA
Department of Civil and Environmental Engineering
2004-2005
Pre-Doctoral Instructor

HUMAN INTERFACE TECHNOLOGY LABORATORY, SEATTLE, WA
University of Washington
2001-2003
Research Associate

NORTH STAR LEADERSHIP GROUP, PHOENIX, AZ
Management Consultants
July – December 2004
Consultant

UNIVERSITY AT BUFFALO, BUFFALO, NY
Department of Civil and Environmental Engineering
August 2000-2001
Graduate Assistant

DEVELOPMENT CONSULTANTS LTD., BOMBAY, INDIA
Engineering Consultants
January – July 2000

Design Engineer

SELECTED PUBLICATIONS

Journals:


Conferences:

Anderson, G. R., Onder, N. & Mukherjee, A. “Expecting The Unexpected: Representing And Reasoning About Construction Crisis Scenarios” In the Proceedings of the Winter Simulation Conference 2007, Washington DC in December 9th-12th, 2007 (also presented)


SELECTED EXTERNALLY FUNDED RESEARCH GRANTS

- Understanding Mental Models of Expertise in Construction management Using Interactive Adaptive Simulations, **PI: Amlan Mukherjee**, Funding Agency: **National Science Foundation.** (Project Value: $228,086, December 2006 – December 2009)
  o Effective construction management decision-making under constraints of time, resource, and rapidly unfolding events requires knowledge of complex inter-relationships between several simultaneous events and apprehending uncertainty and risk arising from feedbacks delocalized in time and space. Such knowledge is inductively constructed by assimilating and organizing experiential knowledge into patterns of information that are difficult to formalize or analytically perceive. The researchers propose to use an interdisciplinary approach to understand how expert and novice construction managers differ in their knowledge organization, information processing, risk assessment, and decision-making in construction management crisis scenarios. Recent advances in simulations and data analysis techniques will be used to investigate the cognitive and engineering aspects of decision making in complex dynamic construction management scenarios. Though the research effort will focus on the construction management domain, the results from the research will have broader impacts in furthering the understanding of effective decision-making and its impacts in other high stakes, dynamic, time-critical situations like first response to natural and human-induced disasters.
  o The researchers propose to develop and use situational simulations for student-centered problem-based learning, which can be shared across institutions and programs. The main objective of situational simulations is to help learners further develop their decision-making skills. The specific goals are to (i) create a web-based collaborative learning environment using interactive situational simulation and visualization techniques, (ii) encourage and facilitate the creation of a construction engineering knowledge base or repository of educational-oriented simulations and complementary activities that expand the learning horizons of students and allow them to take more responsibility for their own learning (iii) create a consortium of universities throughout the country to leverage resources and expertise in order to generate a richer, more cost-efficient, environment for the learner in the construction engineering and management domain.

ACADEMIC ADVISING

PhD Students:
Helen Muga, Civil and Environmental Engineering (Expected graduation summer 2008)

MS Students:
Matt Watkins, Computer Science (Expected graduation summer 2008)
Kedar Gadgil, Civil and Environmental Engineering (2006)

RELATED ACTIVITIES

Professional memberships:
  ▪ Associate Member, American Society of Civil Engineers
  ▪ Member, Construction Research Council
  ▪ Member, American Education Research Association
  ▪ Member, Association of Computing Machinery (ACM) Special Interest Group in Simulations (SIGSIM)

Publications reviewed for:
  ▪ Journal of Construction Engineering and Management, American Society of Civil Engineering,(ASCE) (1)
  ▪ Journal of Materials in Civil Engineering, ASCE (1)
  ▪ Journal of Water Resources Planning and Management, ASCE (1)
  ▪ Construction Research Congress, 2005, ASCE (Referred conference) (2)
  ▪ Winter Simulation Conference, 2007, ACM/SIG-SIM/IEEE, (Referred conference) (1)
Jindong Tan

Assistant Professor Phone: 906 487 3115
Department of Electrical and Computer Engineering Email: jitan@mtu.edu
Michigan Technological University
Houghton, MI 49931

APPOINTMENTS
Assistant Professor, Computer Engineering, Michigan Technological University 2002–present
Graduate assistant, Electrical Engineering, Michigan State University, 1998–2002
Assistant professor, Northeastern University, China 1995–1998
Graduate assistant, Northeastern University, China 1992–1995

PROFESSIONAL PREPARATION
Ph.D. in Electrical and Computer Engineering, Michigan State University 2002
M.S. in Electrical Engineering, Northeastern University, China 1995
B.S. in Electrical Engineering, Lanzhou University of Science and Technology, China 1992

SYNERGISTIC ACTIVITIES
Jindong Tan’s synergistic research activities include mobile robotics, hybrid sensor networks and body area sensor networks. A hybrid sensor network consists of many small sensors and some mobile robotic sensors. His current effects in this area include (a) the development of a distributed dynamic model using graph theory; (b) self-organization algorithms to enhance sensing and communication using mobility; (c) dynamic clustering for energy efficient routing and tracking; (d) coordination and navigation algorithms for a complex network of mobile and static sensors; (e) sensor network applications in Intelligent Transportation Systems. A Body Sensor Network (BSN) consists of a hybrid of wearable, swallowable and implantable wireless miniature sensors, which collectively monitor the medical condition of a patient and provide physicians with immediate feedback. Dr. Tan’s research focus is the development of energy-efficient communication and networking techniques for embedded body area sensor networks. His work has innovative merits in ultra-low power and reliable communication and sensor fusion in body area sensor networks. Dr. Tan’s other areas of interests include networked sensing and control, embedded systems and tele-operation. Dr. Tan synergistic teaching activities include the development of two graduate level courses for the computer engineering program: multi-robot systems and applications, and embedded sensor networks.

FIVE PUBLICATIONS RELATED TO THE PROPOSED PROJECT
US PATENT

Hybrid Robot Motion Task Level Control System, US patent No. 6 456 901

GRADUATE STUDENT ADVISEES

PhD students: Huaming Li, Jin He, Lufeng Shi, Jiang Li, Sheng Hu.

MS students: Hemjit Sawant, Suresh Shenoy, Atul Verma, Qian Zheng, Alok Sabherwal, Andrew J. Zobro, Bharat Choudhary, Rohit Itticheria, An Qi, Xin Jin.

LIST OF COLLABORATORS (LAST FOUR YEARS)

Ning Xi, Fathi Salam, Weihua Sheng, Jizhong Xiao, Wei Kang, Wai Keung Fung, Yantao Shen, R. Lal Tummala, Rob Nowak, Parmesh Ramanathan, William Helton, Amlan Mukherjee, Byung Choi

OTHER PUBLICATIONS RELATED TO THE PROPOSED PROJECT


BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors. Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

<table>
<thead>
<tr>
<th>NAME</th>
<th>POSITION TITLE</th>
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</thead>
<tbody>
<tr>
<td>Jason R. Carter</td>
<td>Chair &amp; Assistant Professor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME</th>
<th>eRA COMMONS USER NAME</th>
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</table>

**EDUCATION/TRAINING** *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michigan Technological University, Houghton, MI</td>
<td>B.S.</td>
<td>2000</td>
<td>Biological Sciences</td>
</tr>
<tr>
<td>Penn State College of Medicine, Hershey, PA</td>
<td>Ph.D. Intern</td>
<td>2002, 2003</td>
<td>Human Physiology</td>
</tr>
<tr>
<td>Michigan Technological University, Houghton, MI</td>
<td>Ph.D.</td>
<td>2003</td>
<td>Human Physiology</td>
</tr>
</tbody>
</table>

A. Positions and Honors

**Professional Positions:**

2000 – 2003 **Graduate Research Assistant,** Department of Biomedical Engineering, Michigan Technological University, Houghton, MI

2002, 2003 **Summer Research Assistant,** Department of Medicine (Cardiology), Penn State University College of Medicine, Hershey, PA

2002 – 2006 **Science Teacher,** Houghton-Portage Township High School, Houghton, MI

2004 – present **Adjunct Assistant Professor,** Department of Biological Sciences, Michigan Technological University, Houghton, MI

2006 – present **Chair & Assistant Professor,** Department of Exercise Science, Health and Physical Education, Michigan Technological University, Houghton, MI

**Other Experience and Professional Memberships:**

2000 – 2003 Member, American College of Sports Medicine

2002 – 2004 Member, Michigan Education Association

2004 Invited Speaker, Experimental Biology Conference, Washington, D.C.

2004 Consultant, National Evaluation System, Lansing, MI

2002 – present Member, American Physiological Society

2006 – present Member, American Heart Association

**Honors:**

2000 Summa Cum Laude, Michigan Technological University

2003 Caroline tum Suden/Francis A. Hellebrandt Professional Opportunity Award, American Physiological Society

2003 K-12 Educator Incentive Award, Michigan Space Grant Consortium

2004 State of Michigan Blue Ribbon Teacher Award, Houghton High School

2004, 2005 Who’s Who Among America’s Teachers, Houghton High School
B. Research Publications


C. Research Support

**Ongoing Research Support:**

FA-9550-07-1-0500 Helton (PI) 07/01/07 – 06/30/08
U.S. Department of Defense – Defense University Research Instrumentation Program
*A Collaborative Laboratory for Human-Robot Interaction at Michigan Technological University*
The purpose of this project is to build a collaborative laboratory between seven departments on campus to examine human-robot interactions. $467,017 (direct).
Role: Co-Investigator

REF-070529 Carter (PI) 07/01/07 – 06/30/08
State of Michigan – Michigan Tech University (REF Award)
*Enhancement of the Exercise Science Research Infrastructure at Michigan Tech*
The purpose of this project is to renovate research laboratories and graduate space for the Exercise Science department. $34,520 (direct)
Role: Principal Investigator

PHS-070614 Carter (PI) 09/01/07 – 08/31/08
Portage Health Sports Medicine Institute
*Optimizing Lactate Clearance in Collegiate Athletes*
The purpose of this project is to examine the effect of post-game submaximal exercise on lactate clearance in collegiate hockey players. $2,273 (direct).
Role: Principal Investigator

R15 HL-088689 Carter (PI) 02/01/2008 – 01/31/2011
National Institutes of Health (NHLBI)
*Fish Oil and Neurovascular Control in Humans*
The purpose of this project is to examine the effect of fish oil on neural and cardiovascular responses to mental stress in normotensive and hypertensive individuals.
Role: Principal Investigator

**Completed Research Support:**

PHS-060620 (PI) 07/01/06 – 06/30/07
Portage Health Sports Medicine Institute
*Physiological Gender Differences in Hockey Players During On-Ice Graded Exercise*
The major goal of this project was to examine ventilatory and lactate thresholds in male and female hockey players during an on-ice graded exercise protocol. $2,273 (direct).
Role: Principal Investigator

REF-060605 Carter (PI) 07/01/06 – 08/31/07
State of Michigan – Michigan Tech University (REF Award)
*The Influence of Reproductive Hormones on Sympathetic Responses to Mental Stress*
The purpose of this project is to examine muscle sympathetic neural and cardiovascular responses to mental stress in women during the different phases of the menstrual cycle. $50,000 (direct)
Role: Principal Investigator
Michele H. Miller
Michigan Technological University
1400 Townsend Drive
Houghton, MI 49931-1295
Phone: (906)487-3025
E-mail: mhmiller@mtu.edu

EDUCATION:
North Carolina State University, Mechanical Engineering, Ph.D. 1994
North Carolina State University, Mechanical Engineering, M.S. 1991
Duke University, Mechanical Engineering, B.S. 1986

EXPERIENCE:
2000 to present Associate Professor, Michigan Technological University, Houghton, MI
2001 to 2002 Visiting Associate Professor, Boston University, Boston, MA
1994 to 2000 Assistant Professor, Michigan Technological University, Houghton, MI
1989 to 1994 Research Assistant, NCSU Precision Engineering Center, Raleigh, NC
1986 to 1989 Manufacturing Engineer, General Motors, Warren, MI

RESEARCH INTERESTS:
Micro-electromechanical systems
Modeling material removal processes
Engineering education

HONORS:
SME Outstanding Young Manufacturing Engineer Award, 2001
NSF CAREER Award, 1999
NSF Summer Student in Japan, 1991

COURSES TAUGHT:
Integrated Design and Manufacturing Tool Engineering
Analysis of Dynamic Systems Automatic Controls
Material Removal Processes and Machine Tools Precision Machine Design
Metrology and Computer-Aided Inspection Human Factors in Engineering

SELECTED PUBLICATIONS:
Fan, X. and M. H. Miller, “Force Analysis for Grinding with Segmental Wheels,”

PROFESSIONAL ACTIVITIES:

Chair of Organizing Committee for 2003 ASPE Annual Meeting in Portland, OR
Memberships: American Society of Mechanical Engineers (ASME), American Society for Precision Engineering (ASPE), Society of Manufacturing Engineers (SME), American Society of Engineering Educators (ASEE), Human Factors and Ergonomics Society (HFES)
Letter from the Dean of the Graduate School

July 18, 2008

I want to let you know about some changes to Michigan Technological University’s policies regarding graduate student tuition and stipends that will be put into place starting in fall 2008.

The changes were proposed by a group of faculty, graduate students, and the dean of the Graduate School who were given a charge in January 2007 by the Executive Team to examine University policies related to graduate tuition and stipends. The group’s final report was presented to the Executive Team in May 2008. [The entire report is available on the President’s website at: www.mtu.edu/mtuonly/reports/]. The Executive Team presented its recommendations to the University’s Board of Control in June 2008. The Board of Control approved the recommendations that are described below. These changes will become effective in fall 2008.

If you have any comments or questions, please contact either Jackie Huntoon or Nancy Byers Sprague (in the Graduate School). We will try to answer any questions or address any concerns.

Jackie Huntoon, dean of the Graduate School

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I. Changes to Tuition Policies:

A. Old policy:
   All graduate students must register for at least 9 credits at the regular tuition rate to be considered full-time.

B. New policy:
   1. PhD students who have satisfactorily completed both their qualifying and dissertation proposal exams as well as all courses required for their degree (as applicable) can move into full-time research-only mode. The Graduate School will continue to enter documentation of completion of the proposal exam (or equivalent) into BANNER when the D6 form is received in the Graduate School. Departmental staff members will need to continue to enter the results of the qualifying exam (or equivalent exam, typically reported using the D4 form). Students in research-only mode will be eligible to register for full-time research for 9 credits and be charged a graduate research-only tuition rate that is equal to 1/3 of the normal graduate tuition rate at the start of the first semester following the student’s completion of the required milestones. Students will petition (using a standard form available online) the Graduate School for permission to enter research-only mode.
   2. MS students will also be allowed to move into full-time research-only mode at the start of the first semester following completion all required courses as well as the required number of credits for their degree.

C. Rationale:
   Purpose is to provide assistance to faculty who are supporting graduate researchers on external funds and assist self-supported students who wish to be full-time as well as international students who must be full-time for reasons related to immigration.

II. Changes to Minimum Stipend Policies:

A. Old policy:
   1. All supported MS students were required to receive a minimum stipend of $4684 per semester during 2007-08.
   2. All supported PhD students were required to receive a minimum stipend of $5438 per semester during 2007-08.

B. New policy:
   Table 1 summarizes the changes to the minimum stipend levels for MS and PhD students. The Graduate School is
working to streamline methods for running BANNER reports that will help departmental staff determine which category the students within their unit fall. A training session for staff members will be offered as soon as the programming is completed that will allow the reports to be generated on a department-by-department or program-by-program basis. Students will be eligible for the increased stipend and the start of the first semester following completion of the required milestones.

C. **Rationale:**
Purpose is to encourage students to complete required milestones and begin working on their research in a timely manner.

### III. Changes to Continuous Enrollment Policies:

**A. Old policy:**
1. Students who needed time out for special circumstances and due to enrollment in programs with inactive terms enrolled in UN5951 (Graduate Status - Maintenance of Continuous Enrollment). Course carried a $100 fee. A special “no-fee” section was available for students on active military duty (proof of active status was required), Applied Science Education (SASE) students, and students pursuing on-line degrees.
2. Students who were engaged in writing or revising a report, thesis, or dissertation while off campus could enroll in UN5952 (Report, Thesis, Dissertation – Independent Writing and Revision) for 0.25 credits.
3. Students who needed to enroll in one credit to comply with Michigan Tech’s requirement that students must be enrolled in a minimum of one credit during their defense semester could enroll in UN5953 (Final Term Graduate Registration).

**B. New policy:**
1. Allow students who need a “time-out” due to extenuating circumstances (such as illness) or lack of available courses (for students in online or blended degree programs) to register for the no-fee section of UN5951. Graduate School permission (using an online form) is needed prior to registration for this course. The Graduate School will require a doctor’s recommendation for a leave of absence if registration in UN5951 is requested due to illness.
2. UN5952 is now eliminated. Students must register for at least one full credit per academic-year semester to remain continuously enrolled.
3. UN5953 will continue to be used for final-semester enrollment and can now also be used for continuous enrollment purposes if it is more appropriate for a student than enrollment in a single credit of thesis research. Departmental permission is needed prior to students’ registration for this course. Departments will use the same process that is used to grant permission to register for research credits.

**C. Rationale:**
Purpose is to eliminate fee for UN5951, eliminate the 0.25 credit course UN5952, standardize the required minimum enrollment, and reduce the financial incentive for students to leave campus prior to completing their degrees.

### Table 1:
Schedule for minimum stipend rates for MS and PhD students at Michigan Tech during 2008-09. Minimum stipends for the 2007-08 are noted for comparison purposes.

<table>
<thead>
<tr>
<th>Graduate Student Minimum Stipend Rate Categories for 2008-09</th>
<th>Minimum 2008-09 Rates</th>
<th>Minimum 2007-08 Rates For Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS Students</td>
<td>$4,871</td>
<td>$4,684</td>
</tr>
<tr>
<td>Incoming PhDs Lacking an MS Degree</td>
<td>$5,438</td>
<td>$5,438</td>
</tr>
<tr>
<td>Continuing PhDs Lacking an MS Degree</td>
<td>$5,438</td>
<td>$5,438</td>
</tr>
<tr>
<td>Incoming or Continuing PhDs with an MS Degree</td>
<td>$5,656</td>
<td>$5,438</td>
</tr>
<tr>
<td>PhDs After Passing Qualifying Exam (with or without MS)</td>
<td>$5,906</td>
<td>$5,438</td>
</tr>
<tr>
<td>PhDs After Passing Qualifying and Proposal Defense Exam (with or without MS)</td>
<td>$6,156</td>
<td>$5,438</td>
</tr>
</tbody>
</table>

1. Departments or faculty can use funds from external or Michigan Tech Fund sources to provide students with higher stipends up to a maximum of $30,000 per year. Support from Michigan Tech Fund sources can also be used to supplement stipends funded from Michigan Tech’s General Fund (i.e., GTA stipends).
<p>| | |</p>
<table>
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<tr>
<td>2.</td>
<td>Incoming PhD students who lack an MS who have already been made offers of support will be &quot;grandfathered in&quot; and receive support at the 2007-08 minimum PhD stipend level. Beginning in fall 2009, all newly accepted PhD students lacking an MS will receive minimum support at a level equal to the MS rate. After completion of the qualifying exam, all PhD students will receive minimum support at the post-qualifying exam rate.</td>
</tr>
<tr>
<td>3.</td>
<td>This stipend rate will be used by Research and Sponsored Programs for all PhD students during the preparation of budgets for proposals to external sponsors.</td>
</tr>
</tbody>
</table>
Memo

To: Graduate Faculty Council

RE: Information regarding distribution of Graduate Teaching Assistant (GTA) support

From: Jackie Huntoon, Grad School

Date: September 2, 2008

As you know, the University’s Board of Control and our Executive Team are committed to increasing the amount of research and the number of graduate students (particularly PhD students) at Michigan Tech.

The method the Graduate School uses to allocate internal support for graduate students is intended to contribute to this goal by rewarding units that are currently graduating many graduate students (PhD in particular) and by making it possible for other units to increase their graduate numbers and graduation rates.

Since I became dean, I have reviewed the allocation of internally supported GTA “lines” each year based on data from the preceding three academic years. I do this so that resources are allocated based on recent events rather than historical precedent. A unit’s allocation is not considered part of its “base” budget, as it may either increase or decrease from one year to the next. My guiding principal is that no unit will ever lose more than two lines in a given allocation cycle. Therefore, if you know what your unit’s allocation is this year, you can be certain that next year you will receive, at a minimum, no fewer than your current allocation minus two.

I am writing this memo because many faculty members have told me that they are unfamiliar with the procedure used to allocate the GTA resources and about what individual units can do to potentially increase their allotted resources.

The steps in the allocation decision-making process are described below. The Graduate School works with the college deans during the final stages of the process.

**Step 1: Data collection** – Data for the last three years are used. All data were originally collected by Institutional Analysis. All data are considered at the department or school level. The data used in the allocation decision-making process are:

a. Number of laboratory student credit hours taught.
b. Number of non-laboratory student credit hours taught.
c. Number of MS graduates per year.
d. Number of PhD graduates per year.
e. Number of full-time equivalent tenure and tenure-track faculty (T/TT).

**Step 2: Data normalization** – All data are averaged over the preceding three-year period. Credit hour and graduation values are converted to values per T/TT. Time averaging is used to smooth out
anomalous highs or lows in the data. Conversion to per T/TT is used to reduce the impact that large (or small) department or school size can have on the data.

**Step 3: Goal for graduate student graduation rates** – The goals are based in part on the University’s Strategic Goals for 2012. For example, the 2012 goal for the number of graduate students (overall) is 1250. Of these, 750 are anticipated to be MS students and 500 are anticipated to be PhD students. An unspecified number of the 750 MS are intended to be involved in “professional” master’s programs. All of the PhD students are intended to be research active.

While having students on campus is very important, it is even more important to eventually have them graduate. To develop numeric goals for graduation it is assumed that, *on average,*

- a. MS students take three years to complete their degrees
- b. PhD students take five years to complete their degrees
- c. 75% of MS students complete their degrees
- d. 60% of PhD students complete their degrees

Given the current number of T/TT in MS-granting units on campus (281) and the current number of T/TT in PhD-granting units (254), the strategic plan goals for numbers of MS and PhD students, and the assumptions regarding completion rates listed directly above, graduation-rate goals (based on current faculty numbers) are calculated.

- MSgoal = 750/3*0.75/281 = 0.67 (MS graduates per year per T/TT)
  - This means that if we are at goal with our current faculty numbers, we will be graduating, on average, two MS students per T/TT every three years.
- PhDgoal = 500/5*0.6/254 = 0.24 (PhD graduates per year per T/TT)
  - This means that if we are at goal with our current faculty numbers, we will be graduating, on average, one PhD student per T/TT every four years.

**Step 4: Actual vs. Goal for graduate student graduation rates** – The actual graduate student graduation rate (per T/TT) is compared to the goal rates (per T/TT) by dividing the actual by the goal:

- MSprod = ActualMS/MSgoal
  - ActualMS equals the three-year average of the number of MS graduates divided by the three-year average of the number of T/TT.
- PhDprod = 3*ActualPhD/PhDGoal
  - ActualPhD equals the three-year average of the number of PhD graduates divided by the three-year average of the number of T/TT. **Note that PhD graduation rates are weighted, using a weighting factor of three. This means that PhD graduation rates “count” three times as much as MS graduation rates.**
If a unit is graduating (based on averages for last three years) 0.67 MS students per T/TT, MSprod = 1. If a unit is graduating greater than 0.67 MS students per T/TT, MSprod>1 and if they are graduating less than 0.67 MS students per T/TT, MSprod<1.

If a unit is graduating (based on averages for last three years) 0.24 PhD students per T/TT, PhDprod = 1. If a unit is graduating greater than 0.24 PhD students per T/TT, PhDprod>1 and if they are graduating less than 0.24 MS students per T/TT, PhDprod<1.

Finally, an overall graduate student graduation productivity is calculated, which is equal to the sum of the MSprod and PhDprod scores divided by four. The divisor is set to four because this is would be equal to the sum of MSprod and PhDprod if a unit’s actual values are equal to the goal values for both MS and PhD students.

Step 5: Goal for student credit hours – Goals for the number of student credit hours taught by a unit are based on the assumption that a full-time teaching-only faculty member can be expected to teach some number of student credit hours (SCHs). The actual number varies from unit to unit. Lecture/recitation and laboratory SCHs are considered independently because a one-credit laboratory course may require two-three contact hours per week, while a one-credit lecture course involves one contact hour per week.

Step 6: Actual vs. Goal for student credit hours – Units with MSprod or PhDprod values ≥ 0 receive “credit” for their work with graduate students. The expected teaching load per T/TT is reduced from full-time teaching levels based on the overall graduate student graduation productivity value. There is a minimum expectation for average teaching load per T/TT within each unit however. This minimum is equal to either 225 lecture SCHs per year (approximately three three-credit lecture sections per year with 25 students per section) or 100 laboratory SCHs per year (about five one-credit laboratory sections per year with 20 students per section).

For example, if the expected full-time teaching load for a unit is equal to 450 lecture SCHs per year per T/TT, and the unit’s graduate student graduation productivity value is equal to four, the goal for the number of lecture SCHs to be taught by the department would be equal to 225 SCHs per year per T/TT. If the unit’s graduate student graduation productivity value is equal to 0, the goal for the number of lecture SCHs to be taught by the department would be equal to 450 SCHs per year per T/TT. If the unit’s graduate student graduation productivity value is equal to two, the goal for the number of SCHs to be taught by the department would be equal to 338 SCHs per year per T/TT. Note that 338 is half-way between 450 and 225.

Step 7: Allocation of Resources – The number of GTA lines allocated to a unit are based on the calculated number needed to bring each unit to its goal teaching load in terms of SCHs per T/TT (see Step 6 above).
Step 8: Final Allocation – The final allocation of GTAs for FY09 is shown in Table 1. New funds that were made available to the Graduate School as part of the FY09 budget allocation process were used to provide assistance to units that were most in need of additional support.

Table 1: GTA Allocations, by department, for the FY09 year.

<table>
<thead>
<tr>
<th>Department / School</th>
<th>Number of MS GTAs</th>
<th>Number of PhD GTAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Biomed</td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td>Chem Eng</td>
<td>2.5</td>
<td>5</td>
</tr>
<tr>
<td>Civil Eng</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Elec Eng</td>
<td>6.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Geol</td>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>Mat Sci &amp; Eng</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>MEEM</td>
<td>10</td>
<td>24.5</td>
</tr>
<tr>
<td>Forestry</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Bio</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

Chem 1 24
Comp Sci 4 12.5
Exer Sci 0 2
Human 5 22
Math 5 22
Phys 2 17.5
Soc Sci 9 4
Sch Tech 1 0

How to Increase a Unit’s Allocation – The most effective way to increase the number of allocated GTA lines is to increase the number of PhD students graduating each year. In a resource-limited environment, this would only result in reallocation of resources from one unit to another, but Michigan Tech’s Board of Control is very supportive of having the University increase its PhD graduation numbers. We all have good reason to expect that progress toward this important Strategic Plan goal will result in an increase in resources in the future.

Some Strategies for Increasing PhD Graduation Numbers –

1) Accept and matriculate more PhD students.
   a. Encourage promising Michigan Tech bachelor’s and master’s students to continue on for a PhD.
   b. Recruit from other sources when on travel or at meetings.
   c. Network with colleagues and encourage them to send good students to Michigan Tech.
   d. Use the Graduate Schools resources (materials, booth, expertise, personnel) to support recruiting efforts.
   e. Make it clear on departmental or other websites when applications are due and when they will be considered by the departmental or program review committee.
   f. Include information about funding opportunities on departmental or other websites.
   g. Separate acceptance decisions from funding decisions. Accept good students quickly (within one month to 6 weeks of receipt of a completed application). Remember that not all students need our funding because their home government (or ours), their corporations, or they themselves are prepared to pay their way.
   h. Make funding offers early. GTA assignments are made in late February. The earliest that graduate students can be required to commit to an offer is April 15. Therefore, the
month of March is a critical time as this is when the best students get their offers and make their decisions.

i. Make sure that PhD students receive offers of support for multiple years (three-five years). Ideally PhD students will spend some of their time on a GTA assignment and some of their time on a research grant or contract. The best students will only come here if their funding is secure. The new tuition and stipend rules make it much easier for researchers to support students with external funding. These new rules are anticipated to result in an increase in the number of PhD students on campus.

j. Encourage students to visit campus and discuss potential research opportunities.

k. Interview students using the internet or by phone if visits are not possible or if there are concerns related to language or other skills/interests. Use SKYPE or another tool to conduct online interviews at very low cost. I personally have found that the TOEFL is not a perfect predictor of many international students’ verbal skills. Having the opportunity to talk to and see someone while we are talking has been very helpful to me in evaluating verbal skills.

2) Help the students that we have on campus make continual good progress toward completion of their degrees. They can be some of our best recruiters.

3) Require students to publish the results of their research in internationally respected peer-reviewed journals (with their advisors as appropriate). Prospective students learn about Michigan Tech and its research through these publications.