ARIZONA STATE UNIVERSITY
PROPOSAL TO ESTABLISH A NEW GRADUATE DEGREE

This template is to be used only by programs that have received specific written approval from the Provost's office to proceed with internal proposal development and review. A separate proposal must be submitted for each individual new degree program.

DEGREE PROGRAM

College/School(s) offering this degree: College of Technology and Innovation (CTI)
Unit(s) within college/school responsible for program: Applied Psychology Program, CTI in collaboration with the Dept. of Engineering, CTI
If this is for an official joint degree program, list all units and colleges/schools that will be involved in offering the degree program and providing the necessary resources: Applied Psychology Program and Dept. of Engineering

Proposed Degree Name: ***PhD in Simulation, Modeling, and Applied Cognitive Science***

Doctoral Degree Type: PhD-Doctor of Philosophy

Proposed title of major: Simulation, Modeling, and Applied Cognitive Science (SMACS)
Is a program fee required? Yes ☐ **No** ☒
Requested effective term: Fall **and year:** 2011
(The first semester and year for which students may begin applying to the program.)

PROPOSAL CONTACT INFORMATION

(Person to contact regarding this proposal)

Name: Nancy J. Cooke **Title:** Professor
Phone: 480-988-2173 **email:**NCOOKE@ASU.EDU

DEAN APPROVAL

This proposal has been approved by all necessary unit and College/School levels of review, and the College/School(s) has the resources to offer this degree program. I recommend implementation of the proposed degree program. (*Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.*)

College Dean Name: Keith Hjelmstad (***Please see attached signature page***)
(***Dean's Designee Approval Submission – Please also see attached Curriculum Planning Email***)
8/13/10
College Dean Signature _____ Date: _____

ARIZONA STATE UNIVERSITY
PROPOSAL TO ESTABLISH A NEW GRADUATE DEGREE

This proposal template should be completed in full and submitted to the University Provost's Academic Council [mailto:curriculum@asu.edu]. It must undergo all internal university review and approval steps including those at the unit, college, and university levels. A program **may not** be implemented until the Provost's Office notifies the academic unit that the program may be offered.

DEGREE PROGRAM INFORMATION

Doctoral: PhD-Doctor of Philosophy

Proposed title of major: Simulation, Modeling, and Applied Cognitive Science (SMACS)

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1. PURPOSE AND NATURE OF PROGRAM

A. Brief program description (This is a catalog type description of no more than 250 words. Include the distinctive features of the program that make it unique. Do not include program or admission requirements.)

Simulation, modeling, and applied cognitive science describes a growing multidisciplinary field (including the disciplines of psychology, engineering, and computer science) that explores how people interact with technological and social systems in contexts that include transportation, medicine, the military, computing, and other complex systems. Cognitive science provides the scientific foundation necessary to address the effective integration of human capabilities and limitations into complex sociotechnical systems (i.e., the practice of cognitive engineering). The application of cognitive science to these systems relies on simulation and modeling methodologies, as well as more traditional empirical, computational, systems engineering, and statistical approaches. The proposed PhD degree will produce individuals who are well-grounded in simulation, modeling, and cognitive science and skilled in the methodologies required for relevant applications to modern systems. Employers in academia, government, and industry have an ever-increasing demand for personnel who can bridge the gap between rigorous theory-driven experimental science and solutions to real-world problems. The PhD degree will provide transdisciplinary research-driven training in the mathematics, computing, engineering, technology, and psychology of human systems integration.

B. Total credit hours required for the program: 84 (30 from a previously awarded master's degree which is required for admission to this PhD program.)

C. Are any concentrations to be established under this degree program? ☐ Yes ☒ No

2. PROGRAM NEED. Explain why the university needs to offer this program (include data and discussion of the target audience and market).

In the recent Site Visit Report for the Applied Psychology Program Review (dated 06/10/2008) the first recommendation made by the site visit team was: "provide the department with the autonomy to define a PhD program". The reviewers cite several benefits

to this initiative including improving the 1) educational opportunities for our graduate students interested in the application of cognitive science, 2) increasing the return on investment for faculty in training students (it takes roughly two years for graduate students to reach a high level of laboratory productivity), and 3) providing better trained personnel for government, industry and academic positions to address critical and challenging societal problems such as effective coordination of emergency response efforts, reduction of driver distraction, effective design of electronic health records, and the remote control of drone planes and integration into the National Air Space. These problems and others like them require multidisciplinary teams of cognitive scientists, engineers, computer scientists and domain specialists. Similar programs at other universities exist either within an engineering school or a psychology school. The proposed degree offered by two units, namely Dept. of Applied Psychology and Dept. of Engineering within the College of Technology and Innovation takes advantage of the unique positioning of psychology and engineering disciplines within the same college. Therefore, this proposed degree program is well-positioned to train the truly transdisciplinary individual, capable of working effectively on teams to solve these problems and thus is well-aligned with the objectives of the New American University. Individuals who have undergraduate or Masters degrees in cognitive science or experimental psychology who want to address problems in sociotechnical systems would be well-suited for this program as would engineers and computer scientists who intend to work on cognitively-intense problems. In addition, we anticipate that individuals in the workforce in government, military, or industrial settings who have been exposed to these problems and who are working to improve sociotechnical systems would also benefit from the theory and methods offered through this degree program.

3. IMPACT ON OTHER PROGRAMS. List other academic units that might be impacted by the proposed program and describe the potential impact (e.g., how the implementation of this program might affect student headcount/enrollment, student recruitment, faculty participation, course content, etc. in other programs). Attach letters of collaboration/support from impacted programs.

This degree program provides new opportunities for students in psychology, computing, and engineering and should draw from students who would otherwise leave ASU for related PhD programs elsewhere. It is not in direct competition with any unit for enrollment, recruitment, faculty participation, or course work.

On the other hand, the degree will provide a connection between Applied Psychology and Engineering, two otherwise diverse units within the College of Technology and Innovation. Students in both units will be provided with additional opportunities for course work, participation in research, and transdisciplinary collaboration. The benefits of the proposed degree are also anticipated to extend beyond these two units to other ASU departments within and outside of the College of Technology and Innovation. For instance, Aeronautical Technology Management (AMT has new air traffic control simulation capabilities that could serve as a testbed for PhD research while at the same time providing valuable research expertise for AMT faculty. Similarly, other ASU researchers working on problems with complex cognitive systems (see list of faculty in Section 7 for examples) could similarly benefit from interactions with PhD students in this area.

Finally, there is also anticipated synergy between the proposed PhD degree program and planned ASU initiatives relevant to the closure of the Air Force Research Lab in the area of

simulation and modeling. A PhD program at the Polytechnic campus is needed in this area to provide a skilled workforce for the center and the center will in turn provide support for faculty and students.

4. **PROJECTED ENROLLMENT** How many new students do you anticipate enrolling in this program each year for the next five years? Please utilize the following tabular format.

5-YEAR PROJECTED ANNUAL ENROLLMENT					
	1st Year	**2nd Year** (Yr 1 continuing + new entering)	**3rd Year** (Yr 1 & 2 continuing + new entering)	**4th Year** (Yrs 1, 2, 3 continuing + new entering)	**5th Year** (Yrs 1, 2, 3, 4 continuing + new entering)
Number of Students Majoring (Headcount)	5	12	22	32	37

5. **STUDENT LEARNING OUTCOMES AND ASSESMENT**

A. List the knowledge, competencies, and skills students should have when they graduate from the proposed degree program. (You can find examples of program Learning Outcomes at (http://www.asu.edu/oue/assessment.html).
see below

B. Describe the plan and methods to assess whether students have achieved the knowledge, competencies and skills identified in the Learning Outcomes. (You can find examples of assessment methods at (http://www.asu.edu/oue/assessment.html).

1. Foundations of Simulation Modeling and Applied Cognitive Science

Outcome: Core competency in the foundations of simulation, modeling, and applied cognitive science. There are two competencies related to this outcome: a) Students will have a graduate level understanding of modeling design theories, simulation formalisms, and modeling analysis and b) Students will have a graduate level understanding of the study of systems from a Cognitive Science perspective.

Assessment: Students must maintain a grade of a B (i.e., 3.0) or better in foundation courses. This capability will also be critically assessed in the comprehensive exam by the student's doctoral committee.

2. Methods and Tools

Outcome: Familiarity with methods and tools associated with this specialty and proficiency in a subset (to include modeling (cognitive, dynamic, math, statistical), simulation, simulation-based training, synthetic task environments, knowledge elicitation, cognitive task analyses, usability methods, multivariate analysis, communication analysis). There are two competencies related to this outcome: a) Students will have a graduate level understanding of simulation and modeling

methods, tools, algorithms, and approaches and b) Students will have a graduate level understanding of the tools and methods used to model and analyze data, information, and knowledge from a Cognitive Science perspective.

Assessment: Grade of B (i.e., 3.0) or better in methods core courses and proficient use of one or more of these methods in comprehensive exam as assessed by student's doctoral committee.

3. Application

Outcome: Understanding of the systems perspective and familiarity with one or more application areas. There is one competency related to this outcome. Students will have the ability to apply foundations of simulation, modeling, and cognitive science to a particular application domain.

Assessment: Grade of B (i.e., 3.0) or better in application domains courses. Students will be required to complete a comprehensive exam which id to focus on one or more application areas. The comprehensive exam will be assessed by the doctoral committee,

4. Research

Outcome: Capability to independently conduct scholarly work and research within the domain of simulation, modeling, and applied cognitive science.

Assessment: Scholarly abilities and independence will be assessed continuously by each student's doctoral committee and critically at two milestones: 1) a written dissertation proposal and 2) a completed doctoral dissertation.

6. ACCREDITATION OR LICENSING REQUIREMENTS (if applicable). Provide the names of the external agencies for accreditation, professional licensing, etc. that guide your curriculum for this program, if any. Describe any requirements for accreditation or licensing.

We do not seek accreditation for this program. The Accreditation Board for Engineering and Technology (ABET) does not accredit PhD programs and though the Human Factors and Ergonomics Society (HFES) does accredit traditional human factors graduate programs, the proposed program with a joint focus on cognitive science and modeling and simulation is outside of the HFES scope.

7. FACULTY, STAFF AND RESOURCE REQUIREMENTS

A. Faculty

i. Current Faculty. List the name, rank, highest degree, area of specialization/expertise and estimate of the level of involvement of all current faculty who will teach in the program.

Listed by level of involvement

LEVEL 1 High Involvement: Member of current planning committee, teaching core courses, and supervising students

Vaughn Becker, PhD, Assistant Professor, CTI* Applied Psychology, applied social psychology, social perception, social systems simulation

Jennifer Bekki, PhD, Assistant Professor, CTI Engineering, discrete event simulation methodology, simulation of manufacturing systems (particularly semiconductor manufacturing systems), and applied statistics

Russell Branaghan, PhD, Assistant Professor, CTI Applied Psychology, human factors, human-computer interaction, human factors in medicine, memory and cognition

Nancy J. Cooke, PhD, Professor, CTI Applied Psychology, cognitive engineering, human factors, military and medical systems, team cognition

John Femiani, PhD, Assistant Professor, CTI Engineering, computer graphics, computer vision, pattern recognition and image processing

Kevin Gary, PhD, Associate Professor, CTI Engineering, Software process and automated workflow, software architecture and design, portal technologies, relational database management systems.

Mark Henderson, PhD, Professor, CTI Engineering, global product design, social entrepreneurship, biofuels, clean water, strategic product development

Tim Lindquist, PhD, CTI Engineering, Professor, Web-based applications, software engineering, service-oriented software applications, mobile computing, and workflow

Ann McKenna, PhD, Associate Professor, CTI Engineering, engineering design education

Darryl Morrell, PhD, Associate Professor, CTI Engineering, engineering pedagogy, stochastic decision theory applied to sensor scheduling and information fusion

Anshuman Razdan, PhD, Associate Professor, CTI Engineering, geometric modeling and visualization

Chell Roberts, PhD, Associate Professor, CTI Engineering, engineering, industrial engineering

Ben Ruddell, PhD, Assistant Professor, CTI Engineering, modeling complex systems

Christopher Sanchez, PhD, Assistant Professor, CTI Applied Psychology, individual differences, cognition, learning and design

LEVEL 2 Intermediate Involvement: Potential graduate faculty member, teaching electives, and supervising students

Ward Brady, PhD, Professor, CTI Applied Sciences and Math, physics

Yun Kang, PhD, Assistant Professor, CTI Applied Sciences and Math, mathematics

Mary Niemczyk, PhD, Associate Professor, CTI Aeronautical Management Technology, Metacognition, pilot cognition

Xihong Peng, PhD, Assistant Professor, CTI Applied Sciences and Math, physics

Igor Shovkovy, PhD, Assistant Professor, CTI Applied Sciences and Math, physics

Maxim Sukharev, PhD, Assistant Professor, CTI Applied Sciences and Math, physics

Abdessamad Tridane, PhD, Assistant Professor, CTI Applied Sciences and Math, mathematics

LEVEL 3 Moderate Involvement: Potential graduate faculty member, teaching electives, and graduate committee member

Nia Amazeen, PhD, Associate Professor, Psychology, treatment of coordination as a complex dynamical system

Eric Amazeen, PhD, Associate Professor, Psychology, ecological and dynamic approaches to perception and action

Prasad Boradkar, PhD, Associate Professor, Industrial Design

Winslow Burleson, PhD, Assistant Professor, School of Computing, Informatics, and Decision Systems Engineering, intelligent tutors, learning technology, Arts, Media, and Engineering, Human computer interaction, creativity and innovation research

Micki Chi, PhD, Professor, Psychology, learning, technology, and expertise

Christian Geiser, PhD, Assistant Professor, Psychology, structural equation modeling, multitrait-multimethod analysis, longitudinal modeling, spatial abilities/mental rotation

Art Glenberg, PhD, Professor, Psychology, embodied cognition
Steve Goldinger, PhD, Professor, Psychology, human memory, psycholinguistics and word recognition, and speech perception, representation, and production
Don Homa, Professor, Psychology, Visual retrieval and decision processes in long- and short-term memory; semantic memory and multidimensional scaling; and the learning of abstract categories.
Mina Johnson, PhD, Assistant Research Scientist, Media, Arts, and Engineering, web-based computer-aided instruction
Kanav Kahol, PhD, Assistant Professor, Biomedical Informatics, development of human-machine symbiotic entities
Pat Langley, Professor, PhD, Psychology & School of Computing, Informatics, and Decision Systems Engineering, machine learning, artificial intelligence
Kurt Van Lehn, PhD, Professor, School of Computing, Informatics, and Decision Systems Engineering, intelligent tutors, learning technology
Roger Millsap, PhD, Professor, Psychology, quantitative psychology, psychometric methods and multivariate statistics
Panagiotis Mitropoulos, PhD, Assistant Professor, Del E. Webb School of Construction, accident prevention, high performance crews, lean production management, and organizational innovation
Federico Sanabria, PhD, Assistant Professor, Psychology, timing, memory, associative learning
John Takamura, Assistant Professor, Industrial Design

*CTI = College of Technology and Innovation

ii. **New Faculty.** Describe the new faculty hiring needed during the next three years to sustain the program. List the anticipated hiring schedule and financial sources for supporting the addition of these faculty.

CTI's current anticipated hiring plan provides sufficient faculty for the next three years.

iii. **Administration of the program.** Explain how the program will be administered for the purposes of admissions, advising, course offerings, etc. Discuss the available staff support.

Because the proposed degree crosses two college units, an executive committee will be formed to serve the same function as a graduate program committee within a single unit.

Executive Committee
The activities and requirements for this program will be determined by an Executive Committee. The Executive Committee will include representatives from CTI's Applied Psychology Program and Dept. of Engineering. An acting Director of the program will be voted on by the participating faculty. After the approval of the degree program, the official director will be appointed by the Dean of the College of Technology and Innovation. An acting Committee has been formed (Becker, Branaghan, Cooke, Razdan, Roberts, Sanchez) from faculty volunteers across the

participating units by the acting director and will constitute the Executive Committee if approved by the Dean of the College of Technology and Innovation.

Responsibilities of the Executive Committee
The Executive Committee will oversee the effort of recruitment of new students, recommend admission of new students in consultation with participating units to the Graduate College, oversee content of core courses, approval of and subsequent oversight of student's plans of study (POS) and progress, oversight of interdisciplinary composition of supervisory committees.

Administrative support
Staff support for the administration of the program will be provided by the College of Technology and Innovation. It is anticipated that the required support will be part-time as the new program develops and will require a full-time dedicated staff as the program matures to >35 students. Administrative support will be responsible for preparing, recording, and as necessary, disseminating materials directed by the Executive Committee to include recruiting information, graduate applications, admission decisions, and evaluations of student progress.

B. Resource requirements to launch and sustain the program. Describe any new resources required for this program's success such as new staff, new facilities, new library resources, new technology resources, etc.

Additional staff hours will be required, but these are not anticipated to be significant in the first four years of the program. No new facility, library, or technology resources are required.

It is also anticipated that new courses offered for this degree will be of interest and attended by students outside of the degree program, thus minimizing low enrollment classes at the onset of the degree program.

8. CURRICULAR STRUCTURE OF THE PROPOSED PROGRAM

A. Admission Requirements The requirements listed below are Graduate College requirements. Please modify and/or expand if the proposed degree has additional admissions requirements.

i. Degree. Minimum of a bachelor's degree (*or equivalent*) or a graduate degree from a regionally accredited College or University of recognized standing in a related field such as Psychology, Engineering, Cognitive Science, Computer Science.
Modify or expand, if applicable: A master's degree in psychology, engineering, or computer science or a closely related field will be required.

ii. GPA. Minimum of a 3.00 cumulative GPA (scale is 4.0=A) in the last 60 hours of a student's first bachelor's degree program Modify or expand, if applicable: Graduate college policies apply

iii. English Proficiency Requirement for International Applicants. If applicable list any English proficiency requirements that are higher than and/or in addition to the Graduate College requirement. (See Graduate College policy and procedures http://graduate.asu.edu/admissions/international.html#proficiency): Graduate college policies apply

iv. Required Admission Examinations.
☒GRE ☐GMAT ☐Millers Analogies ☐None Required

v. Application Review Terms. Indicate all terms for which applications for admissions are accepted and the corresponding application deadline dates, if any:

☒ Fall Deadline (month/year): 1/31/2011 and yearly thereafter

☒ Spring Deadline (month/year): 9/30/2011 and yearly thereafter

☐ Summer Deadline (month/year):

B. Degree Requirements. Below provide the curricular requirements for the proposed degree program.

i. Total credit hours (cr hrs) required for the degree program: 84 with up to 30 credit hours accepted from a previously awarded master's degree (also see section 8i)

ii. Core courses. List all required core courses and total credit hours for the core (required courses other than internships, thesis, dissertation, capstone course, etc)**.** Omnibus number courses can not be used as core courses. Permanent numbers must be requested by submitting course proposal to ACRES for approval.

Total cr hrs for required core courses:12 (see attached appendix)

Course prefix & number	**Course title**	**Credit hours**	**New course?**
SMC 541	Foundations of Simulation and Modeling	3	Y ☒ N ☐
SMC 540	Foundations of Applied Cognitive Science	3	Y ☒ N ☐
SMC 521	Methods and Tools in Simulation and Modeling	3	Y ☒ N ☐
SMC 520	Methods and Tools in Applied Cognitive Science	3	Y ☒ N ☐

(Please expand table as needed. Right click in white space of last cell. Select "Insert Rows Below")

iii. Elective Courses or Research

Total cr hrs for program electives: 24 + hours less than 30 accepted from Masters

Provide a sample list of elective courses: See Appendix for list of elective courses (none are new). Some elective courses (e.g., with PSY prefix) are offered at multiple campuses (including the Polytechnic). We anticipate that students in the SMACS program would take these courses at the Polytechnic to minimize overloading enrollment in certain courses at other campuses.

Course prefix & number	Course title	Credit hours	New course?
	See Curriculum Appendix		Y ☐ N ☐
			Y ☐ N ☐

(Please expand table as needed. Right click in white space of last cell. Select "Insert Rows Below")

iv. 400-Level Courses. No more than 6 credit hours of 400-level coursework can be included on graduate student program of study.

1. Are 400-level ASU courses allowed on student program of study for this degree? ☒ Yes ☐ No

2. If yes, how many credit hours? 6

v. Additional Requirements (if applicable). Provide a brief description of any additional requirements (e.g. internships, clinicals, field study, etc.**)**

Total cr hrs for other required courses: N/A

List course info for any additional requirements (e.g. internships, clinicals, field study, etc.)

Course prefix & number	Course title	Credit hours	New course?
			Y ☐ N ☐

(Please expand table as needed. Right click in white space of last cell. Select "Insert Rows Below")

vi. Total cr. hours required for research and/or other elective courses per student's research area (if applicable): 6 (SMC 792)

vii. Culminating experience for the proposed program (please check all that apply and provide requested information):

	Required?	Brief description of the applied project or the capstone course, as applicable.	Course prefix and number	Credit hours
Thesis (master's only)	☐			
Applied Project (master's	☐			

only)				
Capstone course (master's only)	☐			
Dissertation (doctoral only)	☒	Dissertation	SMC 799	12 cr hrs

(Please expand table as needed. Right click in white space of last cell. Select "Insert Rows Below")

viii. **For Doctoral Degrees, indicate the Master's Degree Credit Allowance:** If approved by the student's supervisory committee, does the program allow up to 30 credit hours from a previously awarded master's degree to count towards the degree requirements for this doctoral program? ☒Yes or ☐No

ix. **Committee:** Required Number of Thesis or Dissertation Committee Members (must be at least 3 including chair or co-chairs): 3 with at least one representative from each of CTI Applied Psychology and Engineering

x. **Foreign Language Exam.**

Foreign Language Examination(s) required? ☐Yes ☒No

If yes, list all foreign languages required:

xi. **For Doctoral Degrees, written and oral comprehensive exams are required per Graduate College policy.** Please include any required timelines for successful passing of the comprehensive exams. It is expected that the student successfully pass the comprehensive examinations by no later than the end of their third year.

xi. **Course Prefix(es)** Provide the following information for the proposed graduate program.

a. Will a new course prefix(es) be required for this degree program? Yes ☒No ☐

b. If yes:

- Complete the New Prefix Request Form for each new prefix. This form can be located on the Office of the Executive Vice President and Provost of the University Curriculum Development website at <http://provost.asu.edu/curriculum>.

xii. **New Courses Required for Proposed Degree Program.** Provide course prefix, number, title, and credit hours and description for any new courses required for this degree program. (**See attached Curriculum document)**

APPENDIX

PhD in Simulation, Modeling, and Applied Cognitive Science Curriculum

Students pursuing the degree will work with a committee of at least three faculty members to design a program of study tailored to the interests and background of the student. There should be considerable flexibility in setting the plan of study but it must include a minimum number of credit hours in the areas of *Foundations, Methods and Tools, Applications, Research/Dissertation*. The program should also aim for an interdisciplinary education by including work in various disciplines. CTI Applied Psychology Program and CTI Dept. of Engineering may be the primary participants initially, but as programs develop, additional disciplines (e.g., computer science, psychology, arts, media, and engineering, bioinformatics, informatics) should participate as well. Eighty-four (84) total credit hours are required for the degree (*with up to 30 credit hours accepted from a previously awarded masters program – see section 8i of proposal for applicable degrees*). Examples of courses in the required areas are shown below. Electives can be chosen to provide additional breadth or depth depending on the particular student.

Four new core courses are being proposed which are the four required core courses for this degree (SMC prefix). In addition SMC 792: Research and SMC 799: Dissertation are also being proposed through ACRES.

Foundations: Competencies and Courses (12 credit hours)

Competency 1: Graduate level modeling design theories, simulation formalisms and modeling analysis.
Competency 2: Graduate level understanding of the study of systems, from a Cognitive Science perspective.
Comment: The competencies can be met with two required courses (two new courses totaling six credit hours) and an additional six hours based on student's PhD committee recommendation.

Course Prefix	Course Title	Credit Hours
SMC 541 (NEW)	Foundations of Simulation and Modeling (required)	3
SMC 540 (NEW)	Foundations of Applied Cognitive Science (required)	3
	***Six hours of additional foundation course electives**	
CST 554	Distributed Computing	3
CSE 571	Artificial Intelligence	3
CSE 561	Modeling and Simulation Theory and Applications	3
PSY 528	Sensation and Perception	3
CSE 555	Theory of Computation	3
PSY 535	Cognitive Processes	3

Methods and Tools: Competencies and Courses (12 credit hours)

Competency 1: Graduate level understanding of simulation and modeling methods, tools, algorithms, and approaches.
Competency 2: Graduate level understanding of the methods used to model and analyze data, information and knowledge from a Cognitive Science perspective.
Comment: The competencies can be met with two required courses (two new courses totaling six credit hours) and an additional six hours based on student's PhD committee recommendation.

Course Prefix	**Course Title**	**Credit Hours**
SMC 521 (NEW)	Methods and Tools in Simulation and Modeling (required)	3
SMC 520 (NEW)	Methods and Tools in Applied Cognitive Science (required)	3
	***Nine hours of additional methods electives**	
PSY 530	Intermediate Statistics	3
PSY 531	Multiple Regression in Psychological Research	3
PSY 561	Methods in Applied Psychology	3
PSY 534	Psychometric Methods	3
PSY 576	Dynamical Systems in Psychology	3

Applications: Competency and Courses (12 credit hours)

Application Competency: The ability to apply foundations and methods of modeling, simulation and cognition to a particular application domain.
Comment: This competency will be met through a selection of 12 credit hours of application domain courses based on student's PhD committee recommendation. See example courses from course inventory below.

Research and Scholarship: Competency and Courses (18 credit hours)

Research and Scholarship Competency: Ability to conduct scholarly work in the domain of modeling, simulation and cognition.
Comment: The student will take eighteen credit hours. Twelve credit hours will be for Dissertation as required by the Graduate College and six credit hours of research or electives based on student's PhD committee recommendation.

Course Inventory

***Foundations* (12 credit hours)**

SMC 541: Foundations of Simulation and Modeling (3) REQUIRED

Design theories, simulation formalisms and modeling analysis in Engineering and Computing

Course Description:
The goal of this course is to develop a foundation in the fundamental areas of modeling and simulation that will guide the student in understanding different perspectives, uses,

modeling approaches and applications in the field. This course will also prepare students with an understanding of the most frequently used simulation and modeling architectural elements and foundation content knowledge needed to understand current trends and issues in modeling and simulation as well as contribute to advancing the field through research.

SMC 540: Foundations of Applied Cognitive Science (3) REQUIRED

Graduate level understanding of the interdisciplinary study of intelligent systems including approaches from psychology, artificial intelligence, and philosophy.

Course Description:
The goal of this course is to provide an in-depth exploration of the interdisciplinary field of cognitive science. This class will explore the philosophical foundations of cognition and the philosophy of science, and use this understanding as a basis for understanding other aspects of how our mind works, such as the organization of cognitive architecture, information processing, reasoning, cognitive development, perception, language and problem solving. The overall goal of the class is thus to understand how we think and process information, and how cognitive capabilities and limitations relate to understanding human interaction with complex systems in the external environment. This goal will be accomplished by reading recent and classic scientific journal articles, class discussion and will culminate in the design of a hypothetical experiment or project to test your ability to apply this knowledge.

CSE 571 Artificial Intelligence (3)

Definitions of intelligence, computer problem solving, game playing, pattern recognition, theorem proving, and semantic information processing; evolutionary systems; heuristic programming.

CSE 555 Theory of Computation (3)

Rigorous treatment of regular languages, context-free languages, Turing machines and decidability, reducibility, and other advanced topics in computability theory

CSE 561 Modeling and Simulation Theory and Application (3)

Modeling theories, simulation protocols, object-oriented modeling, model design, simulation analysis, network-based systems, discrete-event modeling, continuous modeling, hybrid modeling.

CST 554: Distributed Computing (3)

Topics in distributed systems, including communications, distributed operating systems, fault-tolerance, and performance issues.

PSY 528: Sensation and Perception (3)

Principles of sensory and perceptual processes, emphasizing research literature.

PSY 535: Cognitive Processes (3)

Theoretical/empirical treatment of the human organism as a processor of information, including abstraction, memory structure, problem solving, and thinking.

***Tools and Methods* (12 credit hours)**

SMC 521: Methods and Tools in Simulation and Modeling (3) REQUIRED

A study of contemporary simulation and modeling tools and environments and to their suitability to particular class of problems. Discrete event and continuous modeling of engineering and computing systems.

Course Description:
The goal of this course is to provide an introduction to the methods and tools that are

commonly used in the field of modeling and simulation. Topics include: M&S paradigms including Monte Carlo, continuous, and discreet event simulation; and concepts from supporting disciplines including probability and statistics, systems modeling, simulation model development, input analysis, and verification and validation approaches. Students will be introduced to computer science concepts essential for implementation of simulations. There will be an emphasis on design and analysis of models, algorithms and implementation and use of data structures. One or more computer simulation languages will be used in this course.

SMC 520: Methods and Tools in Applied Cognitive Science (3) REQUIRED

Data analysis and modeling, information and knowledge – centric methods used in applied cognitive science

Course Description:
The goal of this course is to provide an introduction to the methodology and tools that are commonly used in the field of cognitive science. This class will provide a breadth of experience in methods and tools used to design experiments, prepare experimental materials, analyze data, conduct simulation, and modeling cognition in complex systems. When appropriate, this hands-on approach will also be accompanied by various readings which will be used to supplement your own experiences. The overall goal of this class is to provide you with the necessary skill set to conduct investigations in the field of applied cognitive science, and thus facilitate the completion of the degree and ensure eventual success in the field.

PSY 530: Intermediate Statistics (3)

Design and analysis of experiments including nested, factorial, balanced, and repeated measures designs, analysis of variance, linear contrasts, planned and post hoc comparisons.

PSY 531: Multiple Regression in Psychological Research (3)

Regression models and methods including hierarchical models, stepwise fitting, logistic regression.

PSY 561: Methods in Applied Psychology (3)

Various topics in methods for collecting data including experiments, surveys, and observations. Often includes computer programming experience, for example using MATLAB, Flash, or ACT R

PSY 534: Psychometric Methods (3)

Issues and methods involved in developing measurement instruments.

PSY 576: Dynamical Systems in Psychology (3)

The application of dynamical system methods to the modeling of cognition and behavior. Includes methods from chaos theory, fractal geometry, dynamical attractors, etc.

Applications **(12 credit hours) Example courses**

CSE 598 Software Engineering I (3) Topics in software engineering including human-computer interaction

CSE 572 Data Mining (3)

Advanced data mining techniques: classification, clustering, association, preprocessing; performance evaluation; information assurance, Web mining, security and privacy issues, and other applications. Students must have a solid background in database management systems, search, learning, and statistics to be successful in this course.

CST 557: Embedded Applications Development (3)

Current trends in embedded system development using C, assembly, and special purpose hardware. Development versus target environment issues.

PSY 562: Advanced Human Factors (3)

In-depth study of the issues, methods, and findings in human factors. Emphasizes human factors in high-technology systems. Specific topics include systems development, systems analysis techniques, displays, and controls.

PSY 563: Advanced Industrial/Organizational Psychology (3)

In-depth study of the issues, methods, and findings in industrial and organizational psychology. Examines personnel selection, performance assessment, job and workplace design, job satisfaction, organizational behavior, management systems, and industrial safety.

PSY 448 Human Factors in Transportation (3)

Examines human performance and human-machine design issues in aviation and ground transportation.

PSY 449 Human Factors in Sport (3)

Examines how psychological principles can be applied to enhance the performance of athletes and coaches.

***Research and Scholarship* (18 credit hours)**

SMC 792: Research (6) or electives as selected by the PhD committee

SMC 799: Dissertation (12)

ARIZONA STATE UNIVERSITY
PROPOSAL TO ESTABLISH A NEW GRADUATE DEGREE

This template is to be used only by programs that have received specific written approval from the Provost's office to proceed with internal proposal development and review. A separate proposal must be submitted for each individual new degree program.

DEGREE PROGRAM

College/School(s) offering this degree: College of Technology and Innovation (CTI)
Unit(s) within college/school responsible for program: Applied Psychology, CTI in collaboration with the Dept. of Engineering, CTI
If this is for an official joint degree program, list all units and colleges/schools that will be involved in offering the degree program and providing the necessary resources: Applied Psychology and Dept of Engineering

Proposed Degree Name: ***PhD in Simulation, Modeling, and Applied Cognitive Science***

Doctoral Degree Type: PhD-Doctor of Philosophy

Proposed title of major: Simulation, Modeling, and Applied Cognitive Science (SMACS)
Is a program fee required? Yes ☐ **No** ☒
Requested effective term: Fall **and year:** 2011
(The first semester and year for which students may begin applying to the program.)

PROPOSAL CONTACT INFORMATION
(Person to contact regarding this proposal)

Name: Nancy J. Cooke
Title: Professor
Phone: 480-988-2173
email:NCOOKE@ASU.EDU

DEAN APPROVAL

This proposal has been approved by all necessary unit and College/School levels of review, and the College/School(s) has the resources to offer this degree program. I recommend implementation of the proposed degree program. (*Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.*)

College Dean Name: KEITH HJELMSTAD.

College Dean Signature _____ **Date:** 8/13/10

College Dean name:
(If more than one college involved)
College Dean Signature _____ **Date:** _____

CIP Code: _____
(To be determined by the Office of the Executive Vice President and the Provost of the University)

COVER SHEET

CTI Approval – Proposal Submission (PhD in Simulation, Modeling, and Applied Cognitive Science)

From: Karen Hammann
Sent: Friday, August 13, 2010 1:12 PM
To: Curriculum Planning
Cc: Keith Hjelmstad; Robert Gray; Nancy Cooke; Petie Roberts; Chell Roberts; Kevin Gary; Sylvia Schoonover; Nancy Kiernan; Julie Ramsden
Subject: Degree proposals from Technology & Innovation

Attachments: PhD in Applied Cognitive Science Mode and Sim Proposal 7-27-2010.doc; Applied Cognitive Science Modeling and Sim - appendix 7-23-10).doc; SMC 520 Methods and Tools in Applied Cognitive Science Syllabus .docx; 1772_001.pdf; Establish_New_BS_SoftwareEngineering_August2010.doc; Major_Map_BSSoftwareEngineeringAugust2010.xls; 1773_001.pdf

Attached are proposals from the College of Technology & Innovation for two degrees:

PhD in Simulation, Modeling, and Applied Cognitive Science


PhD in Applied Cognitive Scien...


Applied Cognitive Science Mode...


SMC 520 Methods and Tools in A...


1772_001.pdf (69 KB)

BS in Software Engineering


Establish_New_BS_SoftwareEngin...


Major_Map_BSSoftwareEngineerin...


1773_001.pdf (49 KB)

If you have questions, or if we can assist further, please let us know. Thanks.

Karen Fry Hammann
Assistant to the University Vice President
& Dean, College of Technology & Innovation
ASU at the Polytechnic campus
7231 E. Sonoran Arroyo Mall
Santan Hall, Suite 330
Mesa, AZ 85212
480/727-1141
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kfh@asu.edu
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ARIZONA STATE UNIVERSITY

COLLEGE OF LIBERAL ARTS AND SCIENCES
PSYCHOLOGY

MAIN CAMPUS
PO BOX 871104
TEMPE, AZ 85287-1104

(480) 965-3326
FACSIMILE
(480) 965-8544

August 23, 2010

Dr. Keith Hjelmstad
Dean, College of Technology and Innovation
Arizona State University

Dear Dr. Hjelmstad:

We are writing to provide enthusiastic support for the proposed new PhD program "Simulation, modeling, and applied cognitive science." In this letter, we have been asked to address the potential impact on the Psychology Department on the Tempe Campus and the listing of PSY classes as part of the proposed curriculum.

We will believe that the program will have no negative impact on the doctoral program in Psychology on the Tempe Campus. In fact, this will formalize current synergies and promote new ones. Our faculty are happy to participate by teaching potential elective courses, serving on student committees and being potential graduate faculty members.

In terms of PSY courses, our current practice is to have these courses open to students in related doctoral programs pending available seats. We are delighted to welcome doctoral students from the proposed new PhD in Simulation, Modeling, and Applied Cognitive Science. Of course, we cannot ensure that these courses will always be part of our Psychology doctoral program or that they will offered at any particular year. Below, we describe the current frequency of offering for each course in Psychology at the Tempe Campus.

In the Foundations Category, we have two listed courses—PSY 528 "Sensation and Perception" and PSY 535 "Cognitive Processes. We currently offer these courses every 2-4 years.

In the "Tools and Methods" category, there are two courses that are currently offered both at CITI and in our department (PSY 530 and PSY 531). In our department, these two classes are often at capacity. However, we assume that students in the new doctoral program will take these courses in CITI and thus it will have no impact on Psychology. A third class, PSY 561 is given only at CITI, and thus we also assume that it will have no impact on Psychology. PSY 534 "Psychometrics" is offered in Psychology every year. Finally, PSY 576 "Dynamics" is offered in Psychology every two years.

In the "Applications Category," there are four listed PSY courses (PSY 562, 563, 448 and 449). All of these classes are offered at CITI and thus there is no impact on Psychology.

There is only one issue in the current proposal, where we seek some modification, and that is with the listed "key words." In order to clearly distinguish our program from the proposed new program, we request that the word "applied" precede the keyword "cognitive" and the keyword "cognitive science."

If you require any further information, please contact me at laurie.chassin@asu.edu

Sincerely,

Laurie Chassin, PhD.
Regents Professor
Director of Graduate Studies

Nia Amazeen, PhD.
Associate Professor
Director, Cognition, Action, Perception

Ira A Fulton Schools of Engineering
Support Memo

-----Original Message-----
From: Paul Johnson
Sent: Mon 8/23/2010 10:26 PM
To: Keith Hjelmstad; Paul Johnson
Cc: Mitzi Montoya; Chell Roberts; Nancy Cooke
Subject: Re: Letter of Support for Proposed SMACS Degree Program

Hi Keith and Mitzi -

Thanks very much for taking the time today to visit and discuss your proposed Ph.D. in Simulation, Modeling and Applied Cognitive Science (SMACS). The proposed transdisciplinary degree program seems to be a natural fit for the Polytechnic Campus, given the nationally-recognized strength of CERI, the mission of CTI, proximity to AFRL, etc..

The connections between cognitive science, simulation, and technology are of interest to a number of faculty within the Ira A. Fulton Schools of Engineering, and these faculty conduct their research and mentor their students under the umbrellas of our established engineering discipline-oriented graduate degree programs. It appears that launching the SMACS program could create a centralized hub of activity at the Polytechnic Campus that interested Engineering faculty from the Tempe Campus could connect to, and it could potentially also lead to courses being offered that would be of interest to Ira A. Fulton Schools of Engineering graduate students.

Thus, I am supportive of the proposed program and look forward to learning more about it as the planning progresses.

Thanks and Good luck!

PCJ