

The completed and signed proposal should be submitted by the Dean's Office to: curriculumplanning@asu.edu. Before academic units can advertise undergraduate minors or include them in their offerings as described in the university catalogs, they must be recommended for approval by the Senate Curriculum and Academic Programs Committee and approved by the Executive Vice President and Provost of the University.

Definition and minimum requirements:

These are the minimum requirements for approval. Individual undergraduate minors may have additional requirements.

A minor is an approved, coherent focus of academic study in a single discipline, other than the student's major, involving substantially fewer hours of credit than a corresponding major. Certain major and minor combinations may be deemed inappropriate either by the college or department of the major or minor. Inappropriate combinations include (but would not be limited to) ones in which an excessive number of courses in the minor are simultaneously being used to fulfill requirements of the student's major.

A minor:

- Requires a minimum of 15 semester hours of which at least 9 semester hours must be upper division
- Is not intended for students pursuing a major in the department which offers the minor

College/School/Institute: Ira A. Fulton Schools of Engineering
Department/Division/School: The Polytechnic School (CAPPSYCH)
Proposing Faculty Group (if applicable): Human Systems Engineering
Proposed Minor Name: Human Systems Engineering

Requested effective catalog year? 2016-2017
For deadline dates see: Curriculum Workflow Calendars.

Delivery method: On-campus only (ground courses and/or iCourses)

Note: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.

Campus/Locations: indicate all locations where this program will be offered.

Downtown Phoenix Polytechnic Tempe West Other:

Proposal Contact

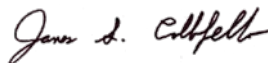
Name: Nancy J. Cooke **Title:** Professor and Program Chair, Human Systems Engineering
Phone number: 480-727-5158 **Email:** ncooke@asu.edu

DEAN APPROVAL(S)

This proposal has been approved by all necessary unit and College/School levels of review. I recommend implementation of the proposed organizational change.

College/School/Division Dean name: James S. Collofello

Signature



Date: 4 /23/2015

College/School/Division Dean name:

(if more than one college involved)

Signature

Date: / /20

Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.

1. Overview

A. Description

Provide a brief description of the proposed minor.

The minor in human systems engineering provides students who design and build technology and systems for humans with the theoretical background and methodological skills to build systems that take into account human capabilities and limitations. The minor extends psychology (cognitive, physiological, perceptual, social, organizational) to engineering applications. The minor will produce students familiar with the science of human cognition and behavior and capable of understanding the implications of this science upon engineering endeavors. Human systems engineering skills are increasingly valued by industry, yet are not typically covered in traditional psychology and engineering programs. Students majoring or minoring in human systems engineering will enhance their employment potential. Human systems engineering is a unique blend of psychology and engineering offered by psychologists in an engineering college.

B. Why should this be a minor rather than a concentration?

This is intended for students not pursuing human systems engineering as a major, but rather engineers and other majors in the Ira A. Fulton Schools of Engineering who would like to supplement their knowledge and skills in engineering and related areas with an understanding of how human characteristics should be considered in those endeavors.

C. Affiliation

If the minor is affiliated with a degree program, include a brief statement of how it will complement the program. If it is not affiliated with a degree program, incorporate a statement as to how it will provide an opportunity for a student to gain knowledge or skills not already available at ASU.

The minor complements the BS degree program in human systems engineering by providing an opportunity for those majoring in other engineering areas and related majors to gain some familiarity and experience in the discipline of human systems engineering. The addition of engineering majors within the Poly human systems engineering courses will enrich the course experience for all involved.

D. Demand

Explain the need for the new minor (e.g., market, student demand, interdisciplinary considerations).

Engineers build technology and systems of technology that are used by humans. Much of this technology never gets used because it does not fit the need or is not useable. The human systems engineering program will provide engineers and others with background in human capabilities and limitations and with methodological skills to translate this theory and research into safer and more effective systems. Engineers and others who develop systems for human needs and usability can 1) make safer systems and 2) enhance marketability.

E. Projected Enrollment

What are enrollment projections for the first three years?

	1st Year	2nd Year (Yr. 1 continuing + new entering)	3rd Year (Yr. 1 & 2 continuing + new entering)
Number of Students (Headcount)	10	50	150

2. Support and Impact

A. Faculty governance

Provide a supporting letter from the chair of the academic unit verifying that the proposed minor has received faculty approval through appropriate governance procedures in the unit and that the unit has the resources to support the minor as presented in the proposal, without impacting core program resources.
letter attached

B. Other related programs

Identify other related ASU programs and outline how the new minor will complement these existing ASU programs. (If applicable, statements of support from potentially-affected academic unit administrators need to be included with this proposal submission.)

As humans are involved in nearly everything that engineers build, a consideration of human capabilities and limitations is paramount in the engineering process. We therefore see the minor in human systems engineering as being complementary to most areas of engineering including software engineering, civil engineering, aerospace engineering, biomedical engineering, and electrical engineering.

C. Letter(s) of support

Provide a supporting letter from each college/school dean from which individual courses are taken.
All courses required for the minor will be offered through the human systems engineering program

3. Academic Curriculum and Requirements

A. Knowledge, competencies, and skills

List the knowledge, competencies, and skills (learning outcomes) students should have when they complete this proposed minor. Examples of program learning outcomes can be found at (<http://www.asu.edu/oue/assessment.html>).

Graduates of the human systems engineering minor program will be able to apply psychological theory and research to engineering problems.

Graduates of the BS in Human Systems Engineering program will be familiar with human systems engineering methods (e.g., experimental statistics, usability methods, cognitive task analysis, prototyping, cognitive modeling) and demonstrate competency in at least three.

B. Provide a description of the curricular requirements for the minor. Be specific in listing required courses as well as electives and specify the total minimum number of hours required for the minor. Please attach one or more model programs of study to illustrate the choices students might make, if appropriate.

Required Minor Courses

Prefix	Number	Title	Is this a new course?	Credit Hours
HSE/EGR	101/103	Introduction to Human Systems Engineering	Yes	3
HSE/EGR	225	Human Systems Integration	Yes	3
HSE/EGR	230	Human Systems and Statistics I	Yes	3
HSE/EGR	290	Experimental Research Methods in Human Systems Engineering	Yes	3
Section Sub-total				12

Elective Minor Courses

Prefix	Number	Title	Is this a new course?	Credit Hours
HSE/PSY	422/449	Human Factors in Sports	No	3
HSE/PSY	423/448	Human Factors in Transportation	No	3
HSE/EGR	424	Human Automation Interaction or HSE/EGR 428 Judgement and Decision Making in Human Systems	Yes	3
HSE/EGR	425/422	Human Medical Systems or HSE/EGR 429 Product Design and Evaluation	Yes	3
HSE/PSY	426/439	Training and Skill Acquisition or HSE 427/EGR 472 Learning and Human Systems Engineering	Yes	3
Section Sub-total				3

Other Minor Requirements

	Credit Hours
E.g. – Capstone experience, internship, clinical requirements, field studies, foreign language skills as applicable	
HSE/EGR 323 Perception and Human Systems or HSE/EGR 324/322 Cognition and Human Systems	3
PSY 438 Human-Computer Interaction	3
	6
Section Sub-total	

Total minimum credit hours required for the Minor 21

C. Minimum residency requirement

How many hours of the minor must be ASU credit? 21

D. New Courses

Provide a brief course description for each new course.

Note: EGR is a temporary prefix for the new courses. We are waiting for approval of the HSE prefix. Once that is approved all of the new EGR courses for this major/minor and a few PSY courses uniquely offered by our unit will be changed to human systems engineering. All new courses have been approved and swapped. We are still waiting on the prefix approval.

Note: The human systems engineering program will allow comparable PSY courses to transfer or substitute for HSE 100 and 200-level courses. The new EGR courses were modeled after existing PSY courses, but with an additional connection to engineering applications. Thus, they can be mapped back to the original PSY courses:

PSY 101=EGR 103
PSY 230 = EGR 230
PSY 325=EGR 223
PSY 290=EGR 290
PSY 350=EGR 224
PSY 437=EGR 225

EGR 103/HSE 101: Introduction to Human Systems Engineering (SB) 3 Introduction to basic principles, methods, and theories of psychology and applications to engineering problems relevant to human systems. Particular attention will be given to the intersection of psychology and engineering. Students will learn brain anatomy and physiology, sensation and perception, cognition, social systems and research methods so that they are able to design systems consistent with human capabilities and limitations

EGR 230/HSE 230: Human Systems and Statistics I (CS) 3 Basic methods of exploratory data analysis (including graphics) and statistical computing methods, including a detailed look at hypothesis testing, effect size and power analysis, as well as some methods for dealing with categorical and discrete data. Both correlation/regression and analysis of variance (ANOVA) will be introduced, as well as common statistical software.

EGR 290/HSE 290 Experimental Research Methods in Human Systems Engineering (L) 3 Introduction to the basics of research methodology as applied in Human Systems Engineering. Quantitative and experimental design from an applied perspective. Guided study of the process of conducting research within human systems engineering. Project topics range from research question generation and literature review to reporting of results.

EGR 225/HSE 225: Human Systems Integration 3 Review of human systems integration (HSI), which is basically systems engineering from a human-centered perspective. Research, theory, and methodological approach as applied to a variety of systems ranging from transportation systems to medical and military systems. Discussion of handbook chapters and specific examples of Human Systems Integration.

EGR 322/HSE 324: Cognition and Human Systems (SB) 3 Human cognition and how it bears on the design of technological and social systems. Although the focus will be on applications, the student will be required to delve into the basic literature that informs these applications, and produce a literature review that draws on both applied and theoretical work. Many weeks will involve a hand-on experience with a method or technique, and the weekly quizzes will emphasize critical thinking about these examples.

EGR 323/HSE 323: Perception and Human Systems 3 In-depth exploration of methods by which humans receive and interpret information from the world by vision, audition, taste, smell, touch, and movement. Emphasizes the integration of behavioral and neural research with potential applications to engineering practice. Topics will cover a wide range from the biological basis of sensory information processing, to the behavioral aspects of perception, and to the applications of perceptual theories to disciplines like computer vision, display technologies, graphic design, and sound processing. Upon successful completion of this course, students will have a solid foundation for further coursework and research in neuroscience or psychology, but also gain knowledge that could be useful in various professions.

EGR 424/HSE 424 Human Automation Interaction 3 Seminar exploring the application of human systems engineering to automation. Human-automation interaction in domains of cyber security, remotely piloted aircraft systems, synthetic teammates, and human-robot interaction. Reading and discussion related to current articles describing research, methodology, and theory.

EGR 422/HSE 425 Human Medical Systems 3 Comprehensive introduction to human factors issues related to healthcare systems, medical training, and medical device design. Topics range from psychological and physiological aspects of human behavior like perceptual and cognitive functions, motor behavior, learning, motivation, physiology, and ergonomics to applied issues in the context of medicine and healthcare like human-computer interactions in

medical information systems, the ergonomic design of medical devices, evaluation of medical device usability, team training in healthcare, and the organization of medical environment.

EGR 428/HSE 428 Judgment and Decision Making in Human Systems 3 Human judgment and decision making is covered as it applies to the design of intelligent systems or decision aids, tools for augmenting human judgment, and understanding consumer decision making. Judgment and decision making approaches, theories, biases, heuristics with applications to engineered systems will be covered.

EGR 429/HSE 429 Product Design and Evaluation 3 Application of human systems engineering methods to product design and evaluation. Consumer behavior, consumer research methods, systems and design thinking, how to conduct interviews, observational research, contextual analysis, questionnaire design and analysis, opportunity identification, usability testing and creativity.

EGR 472/HSE 427 Learning and Human Systems Engineering 3 Introduction to the concept of learning as applied within the human systems engineering area. Overview of the theoretical areas relevant to learning (behavioral, social cognitive, cognitive, emotion and motivation). Applications of these perspectives to enhance the design of systems.

Note: All new required courses should be submitted in Curriculum Changer and ready for Provost’s Office approval before this certificate is put on Curriculum and Academic Programs Committee (CAPC) agenda

4. Administration and Resources

- A. Describe the procedures and any qualifications for enrollment in the minor. Junior status and at least a 2.0 GPA
- B. Describe the advising procedures as well as measures for verification of completion of the minor. Students will be advised by a professional advisor in the Ira A. Fulton Schools of Engineering Poly Advising Services. DARS will be used to verify completion of the program.
- C. What are the resource implications for the proposed minor, including any projected budget needs? Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this minor, please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this minor. No new resources will be required with the possible exception (as the program grows) of larger classrooms and video facilities.
- D. Primary Faculty
List the primary faculty participants regarding this proposed certificate. For interdisciplinary certificates, please include the relevant names of faculty members from across the University.

Name	Title	Area(s) of Specialization as they relate to proposed certificate
Russell Branaghan	Associate Professor	human-computer interaction
Nancy Cooke	Professor	human systems integration
Scotty Craig	Assistant Professor	virtual training technologies
Rob Gray	Associate Professor	human performance, perception & action
Rod Roscoe	Assistant Professor	intelligent tutors
Bing Wu	Assistant Professor	physiological psychology

5. Additional Materials

- A. Appendix
Complete and attach the Appendix document.
- B. Program of study
Provide one or more model programs of study (if appropriate).
- C. Attach other information that will be useful to the review committees and the Office of the Provost.

**APPENDIX
OPERATIONAL INFORMATION FOR MINORS**

(This information is used to populate the Degree Search/catalog website.

Please consider the student audience in creating your text.)

1. Proposed Minor Name:

Human Systems Engineering

2. Description (150 words maximum)

The minor in human systems engineering provides students with the theoretical background and methodological skills to consider human capabilities and limitations when designing and building technology and systems for humans. Human systems engineering is a unique blend of psychology and engineering offered by psychologists in an engineering college. By extending psychology (cognitive, physiological, perceptual, social, organizational) to engineering applications, the minor will produce students familiar with the science of human cognition and behavior, and students will be capable of understanding the implications of this science for engineering endeavors.

Human systems engineering skills are increasingly valued by industry, yet are not typically covered in traditional psychology programs. Students with a major or a minor in human systems engineering will enhance their employment potential.

3. Contact and Support Information

Building Name, code and room number: ([Search ASU map](#))

Program office telephone number: (*i.e.* 480/965-2100)

Program Email Address:

Program Website Address:

WANER 240J

480/727-1874

technology@asu.edu

http://innovation.asu.edu/hse

4. Program Requirements: Provide applicable information regarding the program such as curricular restrictions or requirements, specific course lists, or academic retention requirements.

The minor requires 21 credit hours.

Required Minor Courses (18):

EGR 103/HSE 101 Introduction to Human Systems Engineering (3)
EGR/HSE 225 Human Systems Integration (3)
EGR/HSE 230 Human Systems and Statistics I (3)
EGR/HSE 290 Experimental Research Methods in Human Systems Engineering (3)
EGR/HSE 323 Perception and Human Systems or EGR 322/HSE 324 Cognition and Human Systems (3)
PSY 438 Human-Computer Interaction (3)

Elective Courses (3):

EGR 422/HSE 425 Human Medical Systems (3) or EGR/HSE 429 Product Design and Evaluation (3)
EGR/HSE 424 Human Automation Interaction (3) or EGR/HSE 428 Judgement and Decision Making in Human Systems (3)
HSE 422/PSY 449 Human Factors in Sports (3)
HSE 423/PSY 448 Human Factors in Transportation (3)
HSE 426/PSY 439 Training and Skill Acquisition (3) or EGR 472/HSE 427 Learning and Human Systems Engineering (3)

Total required credit hours: 21

5. **Additional Enrollment Requirements** If applicable list any additional enrollment requirements students must complete
To add the minor in human systems engineering, a student must be in junior status and have at least a 2.00 cumulative GPA.
6. **Delivery/Campus Information Delivery:** On-campus only (ground courses and/or iCourses)
Note: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.
7. **Campus/Locations:** indicate all locations where this program will be offered.
 Downtown Phoenix Polytechnic Tempe West Other:

PROPOSED MINOR IN HUMAN SYSTEMS ENGINEERING

**STATEMENTS OF IMPACT FROM
IRA A FULTON SCHOOLS OF ENGINEERING DIRECTORS**

Dear Fulton Schools of Engineering Directors:

We are proposing a BS and Minor degree in Human Systems Engineering. The proposal for the minor is currently being reviewed at the Provost's office and they have requested that we get impact/support statements from FSE for the minor. I have attached the proposal. We believe that a minor in Human Systems Engineering will have great value for many engineering majors. Please let me know if you can support this proposal or if you have any questions about it.

Thank you,

Nancy J. Cooke

FROM Marco Santello – SBHSE

Hi Nancy,

No concerns from SBHSE.

Best,

Marco

FROM Edward Gibson – SSEBE

No concerns from SSEBE

Best

Edd

G Edward Gibson, Jr.

Director, School of Sustainable Engineering and the Built Environment

Professor and Sunstate Chair

Arizona State University

FROM Ronald Askin – CIDSE

I don't have any objections but it seems like the response should come from Jim and the Dean's Office. We weren't involved in the development and I can't tell from this if there's anyway our students could participate in the minor or if the proposed courses would impact any of ours. I doubt the program will impact us but it might be worth considering cross-listing the Decision Making course with our Informatics Decision Making course. I'll let Brian Nelson respond on that issue.

Ron

FROM Stephen Phillips – ECEE

No concerns from ECEE.

Steve

FROM Kyle Squires – SEMTE

Hi Nancy,

No objections to the proposal. Good luck!

-- Kyle

From: [Clark Presson](#)
To: [Nancy Cooke](#)
Cc: [Keith Crnic](#)
Subject: Re: request for impact statement on new degrees proposed
Date: Thursday, March 26, 2015 7:55:58 PM

Nancy-

Thank you for the opportunity to review the new Human Systems Engineering degree programs by Fulton.

On behalf of the Psychology Department, I am pleased to support the proposal to establish a BS degree program in Human Systems Engineering (as well as the accompanying minor).

This program (with its new prefix and more clearly articulated mission) appears to have great potential to build on the existing strengths of the existing I/O Psychology program to benefit the students at Fulton directly by making more explicit the important human dimensions of successful engineering applications, and more generally will (hopefully) reduce some of the natural confusion of the multiple PSY Psychology degrees.

Many of the courses have understandable overlap with PSY courses from which they have evolved, but the overall program as proposed will more clearly differentiate the new program from the psychology degree programs that our department maintains.

The articulation of the specific courses will be worked out by the programs over time on a course-by-course basis.

Our understanding is that these new HSE courses will replace the current offerings, and that moving forward that PSY courses would no longer be offered by the unit at Poly.

We look forward to the success of your new program.

Clark

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Clark C Presson
Professor and Director of Undergraduate Studies
Department of Psychology
Arizona State University-Tempe
presson@asu.edu

From: Nancy Cooke <Nancy.Cooke@asu.edu>
Date: Monday, March 9, 2015 5:04 PM
To: Keith Crnic <Keith.Crnic@asu.edu>
Subject: request for impact statement on new degrees proposed

