Human Systems Engineering Program

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Human Systems Engineering Program and Faculty

The Master of Science (MS) degree in Human Systems Engineering (HSE) is offered through the Human Systems Engineering (HSE) program at Arizona State University Polytechnic School (part of the Fulton Schools of Engineering). The HSE program emphasizes the application of psychological science, cognitive science, and engineering principles to diverse areas, including decision making, health, human factors, human-computer interaction, learning and education, perception, social processes, team cognition, usability, and product development. Areas of specific focus have included aviation, consumer products, educational technology, health care, military applications, cyber security, and public safety.

The degree requires completion of 30 credits with an average grade of “B” or better. In addition to coursework, students must complete either a research-based Thesis Project or a client-sponsored Applied Project. The Thesis Project involves conducting, analyzing, and presenting a novel research project under the direction of a faculty advisor. The thesis is orally defended in front of a committee and submitted to the Graduate Education office. The thesis is the most typical option, and is also recommended for students planning to later pursue a doctoral program. The Applied Project involves the application of psychological principles to problems and questions determined by a client sponsor. For example, students might work with a startup company to provide website or product usability evaluations, consult with a community organization to develop improved methods for real-world practices, or perhaps develop a new piece of software. Students should work closely with their faculty advisor(s) to develop a plan of study and project that meets degree requirements and academic standards.

Students are also required to attend and participate in a weekly brown bag seminar series in which students, faculty, and visiting scholars will present their work.

Students will complete Annual Progress Reports and receive feedback in the spring or summer. In addition, students are strongly encouraged to meet with their advisor(s) on a regular basis.

Upon completion of the degree, there are many opportunities available to graduates. Some students pursue a doctoral degree at Arizona State University or another institution. Other students seek positions as applied psychologists, human factors engineers, usability engineers, or other jobs in industry or government. Graduates have obtained jobs at the Air Force Research Laboratory, Boeing, GoDaddy, Exponent, Intel, Research Collective, Sandia Research Corp., and Veteran’s Administration Hospitals.

For more information about university policies and procedures, contact Amy Wolsey. Descriptions of full-time HSE faculty and research interests are provided on the following pages.

Amy Wolsey  
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Amy.Wolsey@asu.edu  
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Nancy Cooke, PhD  
Professor  
Graduate Program Chair  
Santa Catalina 150B  
Nancy.Cooke@asu.edu
**Vaughn Becker**, Santa Catalina 150E, (480) 727-1151, vaughn.becker@asu.edu
Dr. Becker currently is developing a psychophysics of social perception, as well as methods to identify biases in such perception. This could facilitate selecting the right individuals for jobs in which unbiased accuracy and rapid decision-making is essential, for example, in military security or air traffic control. He also is interested in general assessments of cognitive functioning under conditions of high stress and/or fundamental motivations. He has an abiding interest in evolutionary psychology, and a background in social psychology, which has sensitized me to both ultimate and proximate sources of bias, e.g. stereotyping, self-presentation, and attribution errors. Dr. Becker's newest interest is in developing agent based models and dynamical simulations of complex social systems.

**Russ Branaghan**, Santa Catalina 150J, (480) 727-1390, russ.branaghan@asu.edu
Dr. Branaghan studies cognitive and social human factors in health care, product development, web, and aviation. He is particularly interested in methods for organizing information to make product more useful, usable and desirable. Recent projects have included usability testing, observational research, design and redesign projects for in-car navigation and information systems, information systems for police cars, and methods for redesigning tasks in hospitals to reduce human error and improve patient safety.

**Erin Chiou**, Santa Catalina, erin.chiou@asu.edu
Dr. Chiou conducts research on microworlds and simulations to explore dyadic exchanges between humans and technology, applying systems thinking to human-automation integration problems, and using mixed methods to improve technology integration in healthcare work. Advances in automation have led to increasingly capable machines, from adaptive algorithms to embodied social agents. Instead of operating remotely behind safety cages, new automation is moving into our more unpredictable human world. These changes shift engineering goals in some domains from reliability to resilience, or the sustained ability to adapt to future surprises as conditions evolve. Dr. Chiou’s findings indicate the importance of considering social exchange factors in human-automation interaction and the need for human-agent cooperation to support system resilience.

**Nancy Cooke**, SANCA 150b, (480) 727-5158, ncooke@asu.edu
Dr. Cooke studies individual and team cognition and its application to the development of cognitive and knowledge engineering methodologies, sensor operator detection of threat, cyber security systems, remotely-operated vehicles, healthcare systems, and emergency response systems. In particular, Dr. Cooke specializes in the development, application, and evaluation of methodologies to elicit and assess individual and team cognition. Based on her empirical work in her synthetic task environments for teams over the last two decades, Dr. Cooke has proposed a theory of Interactive Team Cognition which is published in the journal, *Cognitive Science*. 
**Scotty Craig**, Santa Catalina 150G, (480) 727-1006, scotty.craig@asu.edu

Dr. Craig has conducted projects in such areas as affect and learning, discourse processing, multimedia learning, vicarious learning environments, and intelligent tutoring systems (ITS) in both laboratory and applied classroom settings. His lab, the Cognitive-Based Applied Learning Technology (CoBALT) Lab, seeks to provide cutting edge research at the intersection of human cognition, technology, and the learning sciences which can provide solutions to real world problems within education and training. Current projects include virtual humans for learning and training, music on the web, effectiveness of electronic textbooks for learning, and applications of ITS to training within virtual worlds and classroom and after-school settings.

**Robert Gray**, robgray@asu.edu

Dr. Gray conducts research on the dynamics of perception, cognition, and action in skilled performance. This work addresses issues of human factors, motion perception, driving, tactile interfaces, sports, and aviation. Dr. Gray’s research seeks to advance perception-action theory while directly related to applied problems. He contributes substantial expertise with simulations, including driving and baseball simulators. Dr. Gray will (re)join the Human Systems Engineering faculty in the Fall of 2014.

**Rod Roscoe**, Santa Catalina 150D, (480) 727-2760, rod.roscoe@asu.edu

Dr. Roscoe examines and explores methods for supporting self-regulated and self-directed learning in authentic settings. Learners, when carefully instructed and scaffolded, can create deep learning experiences for themselves and each other. Similarly, adaptive educational technologies can be designed or deployed in ways that augment learning and afford new ways to learn. Dr. Roscoe’s research also targets areas with real-world impact, such as writing proficiency, sustainability, health and wellness, and informed consumer behavior. Ultimately, his research group seeks to empower learners of all ages with productive strategies, technologies, and opportunities that can be sustained over a lifetime of education.

**Bing Wu**, Santa Catalina 150E, (480) 727-3716, bing.wu@asu.edu

Dr. Wu conducts interdisciplinary research in the areas of psychology and engineering. The psychophysical part of his research looks into the mechanisms underlying spatial perception, object recognition, and the control of action by vision and touch. On the applied side, he has specific interests in applying the research results to developing visualization techniques such as for image-guided surgeries, surgical trainers, and new surgical tools. His current work includes studying the multisensory integration of visual and haptic information in object perception and investigating multimodal interactions in augmented reality in medical applications. His research is supported by the National Institutes of Health (NIH).
Degree Requirements Overview

To earn a Master of Science (MS) degree in Human Systems Engineering, students must meet several core requirements pertaining to coursework, research, and professional development. The degree requires completion of 30 credits with an average grade of “B” or better (for graded courses) or “Pass” (for Pass/Fail courses). All students should also carefully review the Polytechnic School Graduate Student Handbook, which offers guidelines, rules, and practices relevant to all graduate programs.

Coursework

- Students are expected to complete several core courses that address essential psychological concepts (e.g., PSY 560: Advances in Theoretical Psychology, PSY 562: Advanced Human Factors), research methods (e.g., SMC 520: Methods and Tools in Applied Cognitive Science), and analysis (e.g., PSY 530: ANOVA). PSY 560: Advances in Theoretical Psychology covers varied topics over time; students should consult with faculty about which will be taught.

- Students are required to enroll in 6-9 credits of elective courses that explore their areas of interest. Electives can be chosen from any relevant graduate course, and students may also take up to two 400-level undergraduate courses, such as HSE 426: Training and Expertise, HSE 424: Human Automation Interaction, and HSE 429: Product Design and Evaluation.

Research

Students are expected to actively engage in research under the guidance of a faculty member. During the first year of the program, students will work closely with the faculty member to support an existing research agenda. Students will typically enroll in 3-6 credits of PSY 592: Research during their first two semesters. Students who participate in research during the summer (e.g., as a paid RA) can also enroll in PSY 592: Research.

During the second year of the program, students will complete an original and independent research-based Thesis Project or a client-sponsored Applied Project.

- The Thesis Project involves conducting, analyzing, and presenting a novel research project under the direction of a faculty advisor. The Thesis Project is the most typical path, and is particularly recommended for students planning to pursue a doctoral program. For the Thesis Project, students enroll in 3 credits of PSY 599: Thesis for two semesters (6 credits total).

- The Applied Project involves the application of psychological principles to problems and processes determined by a client. For example, students might develop a comprehensive report that recommends actionable solutions to real-world challenges, develop improved methods for real-world tasks, or design a novel product. Students will work with a client and faculty advisor to develop a project that meets requirements and standards. For the Applied Project, students typically enroll in 3 credits of PSY 593: Applied Project for two semesters (i.e., 6 credits total).
**Should I pursue a Thesis or Applied Project?** A thesis involves empirical data collection to answer an applied or theoretical question. A thesis may eventually be published in an academic journal. An applied project may or may not involve data collection. Instead it may involve prototyping, design, or a thorough literature review to address a specific client-centered problem. An applied project may also be published, but is more to lead to a patent or portfolio item. The specific track chosen does not appear on the diploma, and those who pursue the applied project do not necessarily rule out advancing toward a PhD program. Similarly, those pursuing a thesis are not ruling out working in industry. The decision is really a matter of preference for experimental human factors or applied human factors work, though keep in mind that the applied project’s research question is initiated by industry.

**Milestones and Timeline**
The following milestones and timeline will help you track your progress through the degree program. The milestones assume that you will complete the degree over a period of about four semesters, though you may make faster or slower progress depending on your work. Your annual evaluations will take into account your progress toward meeting these milestones.

- **Exploration Milestone**: in your **first semester**, you should begin actively exploring topics related to your interests and those of potential faculty mentors. Begin by meeting with each of the program faculty and discussing research topics of mutual interest. Faculty can help you do a deeper dive into one or more topics. For instance, you may be asked to read a set of articles or chapters and prepare an annotated bibliography on the topic. You are encouraged to enroll in HSE 592 and get involved with at least one lab and research. By the end of the semester, you must have selected a faculty advisor and chosen a topic for continued investigation.

- **Development Milestone**: in your **second semester**, will explore your chosen topic in greater depth through additional readings and discussions with your advisor. You are encouraged to enroll in HSE 592 and get involved with at least one lab and research. By the end of the semester, you must identify a well-defined research question to answer (Thesis) or a client-driven problem to analyze or solve (Applied Project).

- **Proposal Milestone**: in your **third semester**, you will enroll in PSY 599 (Thesis) or PSY 593 (Applied Project). You will expand the literature review related to your project focus, and will develop a formal proposal. By the end of the semester, you must submit a proposal to your committee (and client, for Applied Projects). Completing your proposal earlier in the semester offers more time to conduct the work.

- **Synthesis Milestone**: in your **fourth semester** (and beyond), you will conduct your proposed project and enroll in PSY 599 (Thesis) or PSY 593 (Applied Project). Complete the work outlined in your proposal, including data collection, analyses, and interpretation. Next, author your thesis or applied project report and revise based on committee feedback. These tasks may extend across more than one semester depending on the scope of your project and efficiency in conducting the work.
You are solely responsible for your own progress through the program. Failing to complete the above milestones may delay your graduation.

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Action</th>
<th>Deadline (earlier is always better)</th>
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</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>Identify faculty advisor and MS topic</td>
<td>End of Semester 1</td>
</tr>
<tr>
<td>Development</td>
<td>Identify research question or applied problem</td>
<td>End of Semester 2</td>
</tr>
<tr>
<td>Proposal</td>
<td>Submit thesis or applied project proposal</td>
<td>End of Semester 3</td>
</tr>
<tr>
<td>Synthesis</td>
<td>Complete thesis or applied project</td>
<td>End of Semester 4</td>
</tr>
</tbody>
</table>
Professional Development

An important aspect of academic and professional success is participation within a community of scholars and practitioners. For example, individuals might attend research conferences (e.g., the Human Factors and Ergonomics Society annual meeting), participate in professional student groups (e.g., the Human Factors and Ergonomics Society student chapter), attend workshops (e.g., National Science Foundation Proposal Clinic), and give research presentations.

Every semester, students are required to attend and participate in a weekly brown bag seminar in which students, faculty, and visitors discuss contemporary work. Students can enroll in a 1 credit course, PSY 594: Conference and Workshop, to receive credit for attendance.

Annual Progress Reports

Students will complete a report of their progress toward degree requirements in the spring semester and will receive Annual Progress Reports each spring or summer. These reports will provide feedback and guidance on how students are progressing, or need to improve, in terms of coursework, research, and professional development.
Required Courses

PSY 530: ANOVA (3 credits)
This course prepares students to conduct and analyze statistical procedures related to one-way and factorial designs, contrasts, post-hoc tests, probing of interactions, mixed designs, and power. Relevant computer software applications (e.g., SPSS) are also discussed. Alternative statistics courses may fill this requirement if approved by the faculty.

PSY 531: Multiple Regression (3 credits)
This course prepares students to conduct and analyze statistical procedures related to multiple regression and correlation, hierarchical regression, interactions, curvilinear relationships, categorical predictors, ANOVA in regression, regression diagnostics, and regression graphics. Relevant computer software applications (e.g., SPSS) are also discussed. Alternative statistics courses may fill this requirement if approved by the faculty.

PSY 560: Advances in Theoretical Psychology (must be taken twice; 6 credits total)
This diverse course covers contemporary empirical and theoretical research in psychology with emphasis on applicability. The conceptual focus of this course changes each semester depending on the interests of the instructors. For example, prior sections have discussed teams and team cognition, virtual and augmented reality, structural knowledge, and memory. Alternative content courses may fill this requirement if approved by the faculty.

PSY 562: Advanced Human Factors (3 credits)
This course provides an in-depth study of the issues, methods, and findings related to human factors research and industrial and organizational psychology, such as usability assessments, user-centered design and development, and ergonomics.

SMC 520: Methods and Tools in Applied Cognitive Science (3 credits)
This course provides a hands-on approach to understanding and using advanced methodologies commonly implemented in the field of cognitive science, such as experimental designs, quasi-experimental designs, cognitive task analysis, eye-tracking, electroencephalography (EEG) recordings, and other behavioral and physiological recordings. It is highly recommended that you take a research methods course as early as possible.

Elective Courses

Electives: (3 to 9 credits) students can take graduate courses (500-level or above) in our program or other programs as electives. Students can take up to two undergraduate courses (400-level or above) as electives. Consult with your advisor regarding appropriate course options.

PSY 594: Conference and Workshop (1 credit; up to 3 credits over three semesters)
Students will attend and participate in professional development activities such as a weekly research seminar series, academic and professional conferences, workshops, and so on.
Research and Capstone Courses

HSE 592: Research (up to 6 credits)
Under the supervision of a faculty member, students can conduct research that is expected to lead to a specific project such as a thesis or dissertation, report, or publication. Research assignments and responsibilities are determined by the supervising faculty member and might include data collection, experimental work, data analysis, or preparation of a manuscript. Students may enroll in between 1 credit to 6 credits of PSY 592: Research in one semester. Students who work on a paid research project over the summer will enroll in PSY 592: Research.

HSE 599: Thesis (6 credits)
Under the supervision of a faculty member, students will identify a topic and research question(s) of interest; conduct a thorough literature review; develop testable hypotheses; and develop a detailed proposed plan of empirical research and analysis to address those hypotheses. Once the thesis proposal is approved, the student will conduct the planned work. The Thesis should result in an original, meaningful, and rigorous product that contributes to the research literature on the chosen topic. Students should strive to conduct work that merits publication in respected journals within their field.

Typically, students will enroll in 1-3 credits PSY 599: Thesis per semester during their second year, following the completion of introductory research and analysis training. Students must be enrolled in at least one credit of PSY 599: Thesis during the semester they graduate. A “Z” grade is reported on all credits until all thesis requirements are fulfilled.

For more specific details about the processes and projects of conducting a Thesis, please see the Completing a Thesis in Human Systems Engineering section.

HSE 593: Applied Project (6 credits)
Under the supervision of a faculty member and in collaboration with an industry or community client, students will identify a topic or problem of interest; conduct a thorough literature review; and develop a proposed plan of analysis, design, or product development. Once the proposed project is approved, the student will conduct the planned work. The Applied Project should result in an original, meaningful, and useful final product. Such products might include a new piece of software or technology, an analysis of an important phenomenon or problem, recommended solutions or actions, and so on.

Typically, students will enroll in 1-3 credits of PSY 593: Applied Project per semester during their second year, following the completion of introductory research and analysis training. Students must be enrolled in at least one credit of PSY 593: Applied Project during the semester they graduate. A “Z” grade is reported on all credits until all project requirements are fulfilled.

For more specific details about the processes and projects of conducting an Applied Project, please see the Completing an Applied Project in Human Systems Engineering section.
Example Plan of Study

Students’ interactive Plan of Study (iPOS) will be determined based on consultation with an advisor and/or graduate program director. Based on prior experience, students may be able to advance past certain courses. Some students may choose to fulfill some of their requirements during the summer, or may even choose to enroll in more than 9 credits (full-time) during a semester. Please see the Accelerated Master’s Degree section. A student might follow a Plan of Study such as the sample below, but your specific plan of study will likely differ.

Please note that “full-time” status requires enrollment in 9 credit hours in a semester. If you receive funding via a Graduate Assistant position, “full-time” requires enrollment in 12 credit hours.

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Courses</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>1</td>
<td>Fall</td>
<td>PSY 530: ANOVA</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSY 560: Advances in Theoretical Psychology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elective (400-level or above)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>PSY 531: Multiple Regression</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SMC 520: Methods &amp; Tools in Applied Cognitive Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSY 592: Research (or) Elective (400-level or above)</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Fall</td>
<td>PSY 562: Advanced Human Factors</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSY 599: Thesis (or) PSY 593: Applied Project</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>PSY 560: Advances in Theoretical Psychology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSY 599: Thesis (or) PSY 593: Applied Project</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours 30
Completing a Thesis in Human Systems Engineering

The thesis is the culminating project for your Master of Science in HSE. Please note that the thesis is a project that spans your entire tenure in the MS program. See deadlines in brackets (these indicate the latest possible times to complete action). Use the checklist below in order to monitor your progress and complete required procedures.

Checklist

1. **Identify a faculty advisor.** Within your area(s) of research, review the recent research of faculty members and set up meetings to discuss your interests and ideas. [SEM 1]

2. **Identify research topics.** Refine your research interests to select specific topics and questions that you will investigate further via literature reviews and studies. [SEM 1]

3. **Form a thesis committee.** In addition to your advisor, you will invite two or more other faculty members to guide your project. [SEM 2]

4. **Write the thesis proposal.** Provide a thorough review of the relevant literature and detailed description of your planned methods and analyses. [SEM 3]

5. **Schedule a proposal meeting.** Convene your committee to present your proposed research to your committee and receive their detailed feedback and recommendations. [SEM 3]

6. **Institutional Review Board (IRB) approval.** Obtain approval from the IRB prior to conducting your research. All research with human subjects must be evaluated for ethics. [SEM 4]

7. **Data collection and analysis.** Conduct the research as planned and approved by your committee. All deviations from your plan must be reapproved by your faculty advisor. [SEM 4]

8. **Write the thesis document.** Building upon your proposal, provide a detailed report of your background literature, methods, analyses, results, and conclusions. [SEM 4]

9. **Schedule the thesis defense.** Once the thesis has been read by your advisor, schedule the defense. Send your thesis to committee members two weeks in advance. [SEM 4]

10. **Submit your thesis for formatting approval.** After scheduling your defense, submit a copy of your thesis to ASU Graduate Education to ensure correct formatting. [SEM 4]
11. **Defend and revise.** Prepare a professional presentation of your work to be shared with your committee. Be prepared to justify your work and revise based on feedback. [SEM 4]

12. **Present your work at a Brown Bag.** Students are required to present their research at the Brown Bag talk series. This talk can be given before your defense (as practice). [SEM 4]

**Detailed Thesis Procedures**

**Step 1 – Invite a faculty member to be your advisor.**

Your faculty advisor will be your supervisor and primary mentor. Thus, it is important to find a faculty advisor with relevant expertise and mentorship style. Learn more about prospective advisors by studying their published work meeting with them. Keep in mind that an invited faculty member may not always have the time or expertise to accept your request. Please be respectful.

Your faculty advisor must be a full-time faculty member of the HSE program (see Faculty List). Although not required, it is ideal if your work aligns with your advisor’s research, and your participation in funded research (e.g., as a Research Assistant) aligns with your thesis.

**Step 2 – Identify research topics.**

Based on a review of the literature, coursework, conference attendance, and discussions with your colleagues, develop a short list of research questions that might inform your research. As you study the background literature, focus on key unanswered questions and unsolved problems in your field. Choose questions that both interest you and contribute to the broader community.

Building upon your advisor’s past work and expertise can significantly streamline your progress compared to “starting from scratch.”

**Step 3 – Form a thesis committee.**

Based on suggestions from your faculty advisor and discussions with other faculty members, you will invite (at least) two other faculty members to guide your work. Your committee must have at least three members, including (a) one full-time, HSE faculty member and (b) one other ASU faculty member, who may be full-time, adjunct, and from a different program. If any committee member is a non-ASU faculty member, they will need to provide a copy of their recent CV and be approved by the program chair.

Send a description of your topic(s) and research question(s) to potential committee members and request a meeting. It is up to the faculty member whether they choose to be on your committee.

**Step 4 – Write a thesis proposal that includes a clear timeline.**

The thesis proposal presents your research ideas and plans to your committee. It is important that your proposal document be thorough, coherent, and well-written. Your proposal should provide:
A comprehensive literature review that presents the relevant background knowledge for important concepts and principles. The reader should be able to understand the core constructs, theories, and findings that motivate your work. More importantly, the reader should be able to understand the key problems or unanswered questions that your project will address, and appreciate why those problems or questions are valuable to study.

A clear statement of your research questions and hypotheses. The reader should be able to understand exactly what questions that your project will answer. Similarly, when relevant, you should summarize the hypotheses that will be tested and your predicted outcomes. These hypotheses should logically follow from your literature review.

A detailed description and timeline of your proposed research methods, including all data sources (e.g., participants, measures, and instruments) and procedures (e.g., how participants will be recruited, how tests will be administered, and what steps will be followed in the study). The more detail you provide in this section, the easier it will be for your faculty advisor and committee to help you refine and improve your methodology.

A detailed description of your planned analyses (e.g., what comparisons, models, and statistics will be conducted to address your questions and hypotheses).

Work with your faculty advisor to revise multiple drafts until you have a polished proposal. Your advisor will decide when you can proceed to a proposal meeting.

Step 5 – Schedule and conduct a proposal meeting.

Schedule a date and time to present your proposal. All members of your committee must be present, but it is acceptable to have committee members attend via phone, Skype, or other arrangement. Submit your proposal to your committee 10-14 days in advance of your meeting.

Your proposal meeting must be scheduled by no later than your third semester in the program, not including summer semesters.

You will prepare a 15-20 minute presentation that offers an overview of the key background, questions, methods, and analyses. This presentation will be followed by an in-depth discussion of the research proposal with your committee. Your committee will suggest revisions, changes, and improvements that need to be addressed before you are approved to conduct the research.

Step 6 – Obtain Institutional Review Board approval (if necessary).

Any project that involves collection or analysis of data with human subjects requires Institutional Review Board (IRB) approval. The IRB assesses the risks and ethical conduct of all planned research. You will need to complete an IRB proposal form and respond to feedback from a representative of the Office of Research Integrity and Assurance.
Please visit the ORIA website for human research: [http://researchintegrity.asu.edu/humans](http://researchintegrity.asu.edu/humans)

In addition, all graduate students working on any project involving human subjects are required to complete either the Collaborative Institutional Training Initiative (CITI) or National Institutes of Health (NIH) online training course on conducting research. You will need to save a copy of your completion certificate and renew your certification periodically.

**Step 7 – Data collection and analysis.**

Once given approval by your committee and the IRB (if necessary), begin collecting your data. This process can take much longer than you expect; do not procrastinate. Depending on your project, you may be able to collect data via the subject pool (see the HSE Subject Pool section of this document).

In addition to the measures and data you collect, document your procedures and protocols. Make note of any unexpected events or oddities that occur. Most importantly, be careful and meticulous when storing and filing your data! Backup your files often.

**Step 8 – Write the thesis.**

Ideally, your proposal will have been thorough and polished enough that it provides a strong start to your actual thesis. For example, whereas your proposal might have been written in future tense (e.g., “We will collect data on participants’ working memory…”), your thesis may contain the same content written in past tense (e.g., “We collected data on participants’ working memory…”). Nonetheless, you should expect to revise and expand your literature review and methodology sections to reflect your growing expertise and changes that occurred.

The new addition to your thesis will be sections that clearly present the results of your work and the interpretations and findings you obtain. Your thesis document should provide:

- **A thorough and clear reporting of the results** of your analyses. Explain the patterns that were observed in your data and measures. Explain how these results support or do not support your hypotheses and research questions. Report appropriate numerical and statistical data using accepted conventions, tables, and graphs.

- **A thoughtful discussion of the interpretation and impact of your findings.** Summarize your major findings as they relate to your hypotheses. This section will include no data, but rather your interpretations and explanations. In addition, this section should present both the limitations and flaws in your research and discuss directions for future work.

The thesis will need to be formatted in a specific manner according to the ASU Graduate Education Guidelines: [http://graduate.asu.edu/format](http://graduate.asu.edu/format)

As with the proposal, provide a draft of the thesis to your faculty advisor for review and commentary. Your advisor should review the thesis before it is submitted to other committee
members and before scheduling a defense. Work with your faculty advisor to revise multiple drafts until you have a polished thesis. Your advisor will decide when you can proceed to a thesis defense.

Use American Psychological Association guidelines for writing style, references and citations, and reporting outcomes (http://www.apastyle.org/).
Step 9 – Schedule the thesis defense.

Schedule a date and time to present and defend your thesis. All members of your committee must be present, but it is acceptable to have committee members present via phone, Skype, or other arrangement. Submit your thesis to your committee 10-14 days in advance of your meeting.

Importantly, your thesis defense must also be officially scheduled via your MyASU website under the My Programs and Degree Progress “Defense” tab for ASU Graduate Education. This scheduling must be made at least ten working days prior to the actual defense.

More information can be found here: http://graduate.asu.edu/

Step 10 – Submit your thesis for formatting approval.

Soon after scheduling the defense, submit the thesis document to the Graduate Education office (gradformat@asu.edu) for formatting approval. Their office will check your thesis to ensure it conforms to the official format. They will not review your work for content or accuracy.

Step 11 – Defend and revise.

You will prepare a 15-20 minute professional presentation that reviews the important concepts, hypotheses, methods, and findings. This presentation will be followed by an in-depth discussion of the thesis with your committee. Your committee will ask you questions about your rationale, procedures, and findings and you should be prepared to explain and justify your work.

A defense form will be emailed directly to your supervisor. Based on the merit of the research and thesis defense, the outcome will be: Pass, Pass with Major Revisions, Pass with Minor Revisions, or Fail. All committee members will sign the form.

Your committee may suggest revisions before your thesis is approved. Complete these revisions or follow-up work promptly and provide a final, revised thesis to your advisor and committee. The advisor must sign the defense form again to indicate that revisions are complete.

Submit the signed form within 10 days (http://graduate.asu.edu/graddeadlines.html).

Step 12 – Present your work at a Brown Bag.

All students are required to give a presentation about their thesis at our Brown Bag series. This presentation can be scheduled before your defense (e.g., as practice) or after your defense (e.g., to share your success with the community). It is recommended that you use the Brown Bag as a practice opportunity to become more comfortable before your official defense.
Completing an Applied Project in Human Systems Engineering

Another option for your culminating work for the Master of Science in HSE is an Applied Project. The processes and procedures are similar but not identical to those of the thesis. Please note that applied project spans your entire tenure in the MS program. See deadlines in brackets (these indicate the latest possible times to complete action). Use the checklist below in order to monitor your progress and complete required procedures.

Checklist

1. **Identify a faculty advisor and client sponsor.** Within your area(s) of interest, review the recent work of faculty members or potential clients and set up meetings to discuss your plans and ideas. [SEM 1]

2. **Identify project topics.** Refine your interests to select specific topics and questions that you will investigate further via literature reviews and studies. [SEM 1]

3. **Write the project proposal.** Provide a thorough review of the relevant literature, detailed description your planned methods, development process, and/or analyses. [SEM 3]

4. **Get feedback on your proposal.** Your advisor, the PSY 593 instructor, and client will meet with you to provide feedback on your proposal. [SEM 3]

5. **Institutional Review Board (IRB) approval.** You may need to obtain approval from the IRB prior to conducting your research. All research with human subjects must be evaluated for ethics. [SEM 4]

6. **Design, Development, and Analysis.** Proceed with the project as planned and approved. All deviations from your plan must be reapproved by your advisor and client. [SEM 4]

7. **Write the Applied Project report.** Building upon your proposal, provide a detailed report of your background literature, methods, analyses, products, and outcomes. As applicable, develop a portfolio that includes the project. [SEM 4]

8. **Get report feedback and revise.** Have your advisor, PSY 593 instructor, and client review the report. Implement their recommended revisions. [SEM 4]

9. **Schedule report presentation** Your project will be presented as a poster at Innovation Showcase at the end of the semester. For this you will need to prepare a poster and a short elevator pitch about your work. [SEM 4]
Detailed Applied Project Procedures

Step 1 – Identify a faculty advisor and client.

Your faculty advisor will be your supervisor and primary mentor, and your client will guide the specific goals and needs of the project. The instructor of PSY 593 will also help guide you through the process, but your advisor and client will be the subject matter experts. Thus, it is important to find an advisor with relevant expertise and mentorship style. Learn more about prospective advisors by studying their published work meeting with them. Keep in mind that an invited faculty member may not always have the time or expertise to accept your request. Please be respectful.

Your advisor must be a full-time faculty member of the HSE program (see Faculty List). Although not required, it is ideal if your project aligns with your advisor’s research, and your participation in funded research (e.g., as a Research Assistant) aligns with your project.

Step 2 – Identify project topics.

Based on a review of the literature, coursework, conference attendance, and discussions with your colleagues, develop a short list of concepts, questions, and problems that might inform your project. As you study the background literature, focus on unanswered questions, unsolved problems, or product needs in your area of specialization.

Step 3 – Write a project proposal that includes a clear timeline.

The project proposal presents your ideas and plans. It is important that your proposal document be thorough, coherent, and well-written. Your proposal should provide:

- A comprehensive literature review that presents the relevant background knowledge for important concepts and principles. The reader should be able to understand the core constructs, theories, and findings that motivate your project. More importantly, the reader should be able to understand the key problems, questions, or needs that your project will address, and appreciate why those issues are worthwhile.

- A clear statement of your project goals and expectations. The reader should be able to understand exactly what goals your project will seek to attain. Similarly, when relevant, you should summarize the products or resources to be developed or other expected outcomes. These goals should logically follow from your literature review.

- A detailed description of your proposed development process, data collection, or other methodologies, including all procedures (e.g., design planning, observations, usability testing, efficacy trials) and a timeline. The more detail you provide in this section, the easier it will be for your committee to help you refine and improve your plan.

- A detailed description of your planned analyses (e.g., what comparisons, tests, models, and statistics will be conducted to address your goals and expected outcomes).
Step 4 – Get feedback on your proposal.

Provide your advisor, the instructor of PSY 593, and client with a draft of your proposal. This should occur no later than your third semester in the program, not including summer semesters. Arrange to meet with your advisor, PSY 593 instructor, and client (together or separately) to get feedback on the proposal. Make suggested revisions.

Step 5 – Obtain Institutional Review Board approval (if necessary).

Any project that involves collection or analysis of data with human subjects requires Institutional Review Board (IRB) approval. The IRB assesses the risks and ethical conduct of all planned research. You will need to complete an IRB proposal form and respond to feedback from a representative of the Office of Research Integrity and Assurance.

Please visit the ORIA website for human research: http://researchintegrity.asu.edu/humans

In addition, all graduate students working on any project involving human subjects are required to complete either the Collaborative Institutional Training Initiative (CITI) or National Institutes of Health (NIH) online training course on conducting research. You will need to save a copy of your completion certificate and renew your certification periodically.

Step 6 – Design, Development, and Analysis.

Proceed with the project as planned and approved. Once given approval by your committee and the IRB (if necessary), begin your design and development process, data collection, analyses, and so on. This process can take much longer than you expect; do not procrastinate. All deviations from your plan must be reapproved by your advisor and client.

In addition to any measures and data you collect, document your procedures and protocols. Make note of any unexpected events or oddities that occur. Most importantly, be careful and meticulous when storing and filing your data! Backup your files often.

Step 7 – Write the Applied Project report.

Building upon your proposal, provide a detailed report of your background literature, methods, analyses, products, and outcomes. As applicable, develop a portfolio that includes the project.

Ideally, your proposal will have been thorough and polished enough that it provides a strong start to your final report. For example, whereas your proposal might have been written in future tense (e.g., “We will develop a software program...”), your report may contain the same content written in past tense (e.g., “We developed a software program...”). Nonetheless, you should expect to revise and expand your literature review and methodology sections to reflect your growing expertise and changes that occurred.
The new addition to your report will be sections that clearly present the outcomes of your work and the final product(s) developed. Your report should provide:

- A thorough and clear reporting of the outcomes of your analyses, development process, and evaluations. Clearly describe what you have produced. As necessary, report numerical and statistical data using accepted conventions, tables, and graphs.

- A thoughtful discussion of the interpretation and impact of your project. Summarize your major outcomes as they relate to your goals. Clearly explain the utility, applications, and potential impact of your work. In addition, this section should present any limitations and flaws in your project and discuss directions for future work or development.

The applied project report does not need to be formatted in specific a manner according ASU guidelines and does not need to be submitted to the Graduate Education office. Use American Psychological Association guidelines for writing style, references and citations, and reporting outcomes (http://www.apastyle.org/).

**Step 8 – Get feedback and revise.**

Have your faculty advisor, the instructor of PSY 593, and client review the report. Make revisions as suggested by them. Be prepared to revise multiple drafts until you have a polished report. Your advisor and PSY 593 instructor will decide when you are ready to present your work.

**Step 9 – Schedule a report presentation.**

Once the report has been reviewed by your faculty advisor and the instructor of PSY 593, begin to prepare your poster for Innovation Showcase at the end of the semester. The poster should be a highly visual presentation of your applied project report and should cover the important concepts, methods, and outcomes of your work. Also prepare a short (3 minute) “elevator pitch” about your project that you can use as you explain your poster at Innovation Showcase.

**Accelerated Master’s Degree Option**

There is potential for highly ambitious, motivated, and talented students to complete an accelerated version of the Master’s degree program. By simultaneously carrying a significant course load and conducting research, students may be able to complete the program in one year.

Students will need to enroll in 12 credits (9 credits is considered full-time) in the fall and spring semesters, along with 6 credits during the Summer semester. See below for an example plan of study for pursuing an accelerated Master’s degree.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
<th>Credit Hours</th>
</tr>
</thead>
</table>

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Students interested in the accelerated Master’s degree must enter the program with a well-developed agenda for conducting their project. Students will also need to select their faculty advisor before or immediately upon starting the program. HSE 592: Research may be used to begin the student’s Thesis or Applied Project work in the fall and spring. The work will be completed and finalized during the summer (PSY 599: Thesis or PSY 593: Applied Project).

This is a very ambitious and challenging schedule. Careful attention will need to be paid to Arizona State University deadlines and timelines for graduate paperwork.

Students interested in the accelerated Master’s degree should contact the HSE Program Coordinator or Graduate Program Director as early as possible.


**Additional Information**

**Brown Bag Seminars**

The Human Systems Engineering Program hosts a weekly series of talks related to research, applications of research, and graduate education issues. The primary goals of these talks are to provide a forum for sharing and discussing diverse research with colleagues. Attending these talks offers you exposure to new and different fields and career possibilities.

These talks are typically held on *Wednesdays* in the *San Tan Building Room 220*. The schedule of talks will be announced weekly via email. Presentations are archived online.

Importantly, attendance at the seminars is expected and mandatory for all Human Systems Engineering Master’s degree students, regardless of whether you are enrolled in PSY 594: *Conference and Workshop*. Lack of attendance will reflect poorly on you and be noted in your Annual Progress Report.

**Progress Reports**

You will submit a progress report each spring. The purpose of these Annual Progress Reports is threefold. First, we wish to encourage students to formalize their plans for completion of their degree. Second, we wish to provide specific and formative feedback from the HSE faculty on students’ progress. Third, we wish to help you monitor and address any barriers to your progress (e.g., coursework, administrative issues, and project development).

You will be asked to complete a brief self-review form (see final page) which will be considered by the HSE faculty. A faculty member will generate a formative feedback letter.

**Research Beyond the Thesis and Applied Project**

Although your thesis or applied project will be a primary focus of your graduate work, it is also highly recommended and encouraged that you become involved in additional research projects. Your advisor may have other research agendas that interest you, and you may wish to work with other faculty to broaden your own expertise and skill sets. Collaboration with others also creates more opportunities for publication – publishing makes you more marketable for both academic and industry positions.

**Funding**

All MS degree students are eligible for financial support as a Research Assistant or Teaching Assistant. However, such funding is *very competitive* and primarily awarded to doctoral degree seeking students. Please discuss your options with a faculty member and plan accordingly.
Conference Travel

Another way to expand your expertise and curriculum vita (or resume) is to attend and present at academic and professional conferences. Travel support is available through several sources, including the Graduate Education office and the Graduate and Professional Student Association at Arizona State University. There are also funds available through the Polytechnic School for students who are traveling to present their work at a conference.

- [http://graduate.asu.edu/travelgrants.html](http://graduate.asu.edu/travelgrants.html)
- [http://www.asu.edu/gpsa/funding/travel.html](http://www.asu.edu/gpsa/funding/travel.html)

In some cases, a faculty member or your advisor may be able to cover some or all of your travel expenses via grant funding (if your travel pertains to the grant). However, you should not assume that your travel costs will be covered unless clearly indicated by a faculty sponsor.

In many cases, your faculty sponsor will expect you to seek out as many other resources for travel funding before requesting grant support. Be thorough and aggressive in seeking out funding sources – many of them are associated with awards and grants that further boost your curriculum vita!

Human Systems Engineering Subject Pool

A potentially valuable resource for conducting research and data collection is the HSE Psychology Subject Pool. Undergraduate students who are enrolled in select classes (e.g., Introduction to Psychology) are required to participate in research studies as a learning experience. Thus, these students become a pool of potential participants in your research.

To include your study in this program you will need to contact the Subject Pool Coordinator (Dr. Scotty Craig, scotty.craig@asu.edu) for instructions and approval. You will need to specify the number of participants needed, the amount of time needed for your study per participant, and a letter of approval from the Institutional Review Board (IRB). Scheduling for subject pool studies is handled online via an ASU SONA systems account ([https://asup.sona-systems.com/](https://asup.sona-systems.com/)).

How Long Should I Take to Graduate?

A reasonable timeframe to graduate is about two years: four full-time semesters, not including any courses take during the summer semester. The maximum time to complete the Master’s degree is six years as per Arizona State University policy. Use your time wisely and productively to publish, build a strong curriculum vita, and develop your portfolio.

Please refer to the **Milestones and Timeline** section for additional information.
Appendix (Self-Evaluation Guide)

Annual Self-Evaluation Guide

Background

Provide names and contact information for yourself and your advisor. If applicable, provide the names and contact information for your committee, and provide the title (or a working title) for the thesis or applied project.

Coursework

Briefly describe your progress toward completing the required coursework. List the core courses and elective courses you have taken.

Research

Briefly describe the research that you have conducted. Include any research you have contributed to as part of a paid assistantship (i.e., grant funded), PSY 592: Research, PSY 593: Applied Project, PSY 599: Thesis, and/or independently.

Attach an up-to-date curriculum vita or resume. Please highlight the publications that you have contributed to, such as articles, chapters, proceedings, or technical reports.

Professional Development

Briefly describe your engagement in professional development activities. Describe your participation in weekly brown bag seminars, conferences, workshops, and/or academic and professional organizations.

Overall Evaluation

Based on your responses to the above questions, briefly reflect on your overall progress and success in the program. What do you feel are your best strengths and achievements? What areas could benefit from improvement, more effort, or a new approach?

Future Plans

What are your future plans and goals for your coursework, research, and professional development? What courses will you take? How will you advance your research agenda? What professional development opportunities will you seek out?

If you will graduate in the coming year, what are your academic or career plans? Will you apply to doctoral programs? Where might you apply for jobs?