Department of Cognitive and Learning Sciences
College of Sciences and Arts
Michigan Technological University

Graduate Student Handbook

Applied Cognitive Science & Human Factors MS and PhD Programs

Approved 08/29/19

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1   Introduction to the Program

The Applied Cognitive Science and Human Factors program at Michigan Technological University offers both Master's and Doctoral degrees. The programs integrate training in behavioral science and technological design to optimize human performance, education, health, safety, well-being, and sustainability.

1.1   Definitions

Applied Cognitive Science is the application-oriented "multidisciplinary study of minds and other intelligent systems". Applied cognitive scientist-practitioners follow a problem-oriented approach (i.e., non-discipline-oriented) to inform, model, and improve information processing by people, machines, teams, organizations, and other complex systems (Cognitive Science Society, 2014; Thagard, 2005).

Human Factors is the "scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance" (International Ergonomics Association, 2000; The Human Factors and Ergonomics Society, 2014).

1.2   ACSHF Program Mission and Values

Mission: Creating a user-friendly future at Michigan Tech

Vision & Values: We create world-class science and technology by educating and supporting visionary scientist-practitioners who are effective leaders, teamwork facilitators, and diversity advocates. We are committed to innovation, inclusion, and the pursuit of ethical and sustainable development (e.g., social, economic, and entrepreneurial).

1.3   Degrees Offered

The Department offers two advanced degrees in Applied Cognitive Science and Human Factors.

- Master's in Applied Cognitive Science and Human Factors (MS)
- Doctorate in Applied Cognitive Science and Human Factors (PhD)

2   Program Specific Information

2.1   ACSHF Faculty and Staff

2.1.1   Graduate Program Administrators and Staff

Department Chair: Susan Amato-Henderson, Ph.D.

Graduate Program Director: Kelly Steelman, Ph.D.

Department Coordinator: Rachelle Gariepy

2.1.2   Primary Program Faculty

The ACSHF Program has seven Primary Program Faculty. Their contact information and research interests are located on [the ACSHF Faculty website](#).

- Susan L. Amato-Henderson, PhD
- Shane T. Mueller, PhD
- Erich Petushek, PhD
- Samantha Smith, PhD
- Kelly S. Steelman, PhD
- Kevin M. Trewartha, PhD
- Elizabeth Veinott, PhD

2.1.3   Graduate Program Committee

The ACSHF Graduate Program Committee is made up of three faculty in ACSHF and the Graduate Program Director.

Together, they are responsible for reviewing graduate courses and programs, setting program policy and procedure, approving ACSHF Practicums, and evaluating Qualifying Examination Portfolios.

2.2   ACSHF Facilities

The ACSHF Program is part of the Department of Cognitive and Learning Sciences, located in the Harold Meese Building. Faculty, staff, and student offices are located on the 1st and 2nd floors. Research labs are located on the Ground Floor.

2.3   Keys, Desk, Computers, and Research Space Assignments

Prior to the start of your first semester, you will be contacted by the CLS administrative aide with the procedure for acquiring building access and office keys.

All graduate students will be assigned a desk and computer in one of the graduate student offices. Depending on availability, desks and computers may be shared. If you have a research

advisor, you should contact them directly for access to relevant research laboratory space and equipment.

Prior to leaving the university (including for summers), you must clean your assigned office and research space and complete the [Graduate Student Workspace Cleanout Form](#).

2.4   Mail Service

All graduate students have a mailbox in the staff lounge located on the first floor of the Meese Building. You are expected to check your mailbox regularly.

2.5   Forums, Seminars, and Other Meetings

The ACSHF Forum is a venue for sharing and discussing research. Each forum will feature one or two speakers. All graduate students in a research-based program are expected to present in forum once per year (excluding the first year). The presentation should not be a practice talk for your thesis or dissertation proposal or defense.

The Graduate Seminar provides professional development opportunities for all graduate students in the department. Past seminar topics have included resume/CV development, grant writing, scientific presentation, the use of social media in academia, library research skills, networking skills, diversity and inclusion practices for the classroom, and IRB protocols.

The ACSHF Forum and Graduate Seminars are held on alternating Mondays at 2:00 pm during the Fall and Spring Semesters. Your attendance is required at the ACSHF Forum, Graduate Seminar, and any other meeting or function assigned by your mentor, the Graduate Program Director, or the Department Chair.

2.6   Advanced Responsible Conduct of Research

You are required to take an Advanced RCR course within the first year of your enrollment. The university and department offer [several courses](#) that may satisfy the RCR requirements. Most are 1-3 credit courses, offered during the academic year or summer semesters. The ACSHF program offers one 3-credit course (PSY 5020: Research Methods) that both meets the Advanced RCR requirement and may count toward the MS or PhD course requirements. Advanced RCR courses taken through other departments do NOT count toward the 30 credits needed for the MS degree.

As part of advanced RCR training, students are required to complete human subjects training using the full social/behavioral research course offered by the CITI program (http://citiprogram.org).

2.7	Grades

To apply credits earned in non-research courses to a graduate degree or graduate certificate, the courses:

- Must be graded. Pass/fail, audit, or satisfactory/unsatisfactory grades cannot be used on a degree schedule, except when applied as research credits.
- Must have a grade of "B" or better. This requirement can be adjusted at the discretion of the Graduate Program Director to allow for use of "BC/C" grades in up to six (6) credits.

2.8	Student Academic Standing

To remain in good academic standing, you must do all of the following:

- Maintain a cumulative overall GPA of at least 3.0.
- Receive grades of "P" (progress) in research credits.
- Maintain continuous enrollment, as defined by the Graduate School.
- Pass the Qualifying Examination Portfolio process required for completion of the PhD in no more than two attempts.
- Make satisfactory progress toward completion of the degree during each academic-year semester and summer session of enrollment.

2.9	Academic Probation

If you fail to maintain good academic standing, you will be subject to a sanction of graduate academic probation, graduate academic suspension, or graduate academic dismissal. See the [Graduate School Policies and Procedures](#) for more information.

2.10	Grievance Procedure

You have the right to fair and equitable treatment by faculty members, staff, and students. If you have a concern or complaint about a member of our campus community, please consult with ACSHF Graduate Program Director and/or CLS Chair to address the issue. If the issue cannot be resolved within the Department, you can reach out to the University [Ombudsperson](#) or the [Dean of the Graduate School](#).

We also have several offices on campus that handle specific categories of grievances. Issues of academic integrity can be directed to the [Dean of the Graduate School](#). Issues involving gender-based discrimination or sexual misconduct should be directed to the [University Title IX Coordinator](#).

2.11   Voluntary Withdrawal

If you are unhappy in the program, on academic probation, or not making adequate yearly progress, you are encouraged to discuss your options with your advisor and/or the Graduate Program Director. In some cases, your advisor may suggest that you withdraw from the program or find another advisor. Procedures for identifying another advisor are included in Section 3 of this handbook. If you choose not to withdraw from the program, your advisor may consult with the Graduate Program Director about initiating dismissal proceedings.

2.12   Dismissal

You may be dismissed from the program if you do not maintain good academic standing, fail to make satisfactory progress toward a degree, or fail the Doctoral Qualifying Examination Portfolio twice. The dismissal procedure and appeals process are described in the Graduate School Policies and Procedures.

2.13   Absence Policy

If you receive funding through the university in the form of a teaching or research assistantship or fellowship, you are entitled to staff holidays. You are expected to be on campus during the academic term and finals week unless you are involved in off campus research or other scholarly activities. Breaks between academic terms, including the winter break, are not automatically considered holidays or time off. You are responsible for discussing your schedule with your supervisor or faculty advisor and seeking prior approval for any absences.

2.14   Travel Policy

If you travel as part of your research, coursework, or academic outreach, you must fill out the **CLS Student Travel Request Form** to seek approval from the Department. For international travel, you must fill out the **International Travel Request** form before your trip.

2.15   Academic Integrity

Academic regulations and procedures are governed by University policy. Academic misconduct cases will be handled in accordance with the University's policies.

2.16   Assessment

Your student work products (exams, essays, projects, etc.) may be used for the purposes of university, program, or course assessment. All work used for assessment purposes will be anonymized.

Accommodation Policies for Students with Disabilities

If you have a disability that could affect your performance in your program or that requires an accommodation under the Americans with Disabilities Act, please contact your instructor, advisor, and/or Disability Services as soon as possible so that appropriate arrangements can be made. Note that Disability Services can provide support and resources even if you do not have documentation for your disability.

2.17   Institutional Equity

The Department of Cognitive and Learning Sciences is committed to cultivating a just and respectful community that is accessible to all individuals and free from discrimination, harassment, and sexual misconduct. Michigan Tech has a policy of affording equal opportunity to all of its employees, students, applicants for employment, and applicants for admission without regard to race, religion, color, national origin, age, sex, sexual orientation, gender identity, height, weight, genetic information, or marital status, disabled veteran status, veteran status, or disability. Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990.

2.18   Student Workload Standards and Expectations

Success in research and the development of expertise require extended deliberate practice and the thoughtful investment of one's time in scholarship and professional development. If you are a fully funded student, you should expect that the combination of coursework, research, and GRA/GTA responsibilities will require more than 40 hours, but less than 60 hours, of work per week.

Typically, one credit of coursework or research should equate to about 3.5 hours of your time per week. If you are enrolled fulltime (9 credits), this means you should expect to spend 30 or more hours per week on your coursework and research (e.g, 9*3.5 =31.5).

If you are also supported by a grant or department funds (e.g., GRA, GTA, GTI, GADI, etc.), you are expected to perform work for the University (e.g., teach courses, provide research support to faculty) at the usual rate of 20 hours per week for a full appointment. These 20 hours per week are *in addition* to the amount of time you spend on coursework or research credits.

Note that these are guidelines, not strict minimums or maximums. The amount of work required for you to be successful in your classes may vary from semester to semester and class to class. You should be sure to discuss your specific schedule with your research advisor or supervisor each semester. Depending on the phase and nature of the project, some weeks may require a bit more or a bit less work.

2.19   Timely Written Feedback

If you are in a research-based MS program or the PhD program, you will receive constructive written feedback at least annually. This feedback will include an assessment of your progress in the program, including strengths and weaknesses, mutually agreeable goals, professional development milestones, and other issues. This formal process ensures that both you and your advisor(s) are aware of your academic progress and plans for the future. At the end of each spring semester, you should complete and submit the **Annual Graduate Student Progress and Evaluation** Form. Some advisors may fill this out independently. Others may require you to first do a self-assessment. Be sure to discuss this evaluation process with your advisor. Once the form is complete, submit a signed, digital copy to the Graduate Program Director by email no later than two weeks after the end of finals during the spring semester. Copies of the form will be provided to the student, advisor, and Department Chair. If deficiencies are identified in a student's performance, written feedback will be provided twice yearly, specifically addressing the area(s) of deficiency, timeline for making up the deficiency, and consequences for continued unsatisfactory performance.

2.20   Advisors
 2.20.1   Coursework MS Advisor

The Graduate Program Director will serve as the academic advisor to students in the coursework-only Master's Program.

 2.20.2   Research Advisors

The main role of your research advisor is to supervise your research, chair your qualifying examination committee, and advise you on course selection.

 2.20.3   Selecting an Advisor

Students are admitted into the ASCHF Master's (thesis track) and PhD program under the mentorship of an ACSHF faculty advisor. A list of ACSHF Primary Program faculty is included in SECTION 2.1 of this handbook and on the ACSHF website. With the permission of your ACSHF faculty advisor, you may also select a co-advisor. The co-advisor may be any member of the Michigan Tech graduate faculty.

 2.20.4   Changing Advisors

Before initiating the process to change your graduate advisor, please consider all the options listed on the Graduate School's website for how to address difficulties in the student-advisor relationship.

Once you have decided to change your graduate advisor, you must follow the steps listed below.

1. Meet with the Graduate Program Director to initiate the process to change advisor. If meeting with the Graduate Program Director is not feasible or appropriate, meet with the Department Chair.
2. Discuss the following with the Graduate Program Director (or Chair) and, if appropriate, the current advisor:
   a. Whether additional resources within or outside the department (such as the Ombuds office) could help resolve the situation.
   b. The impact of the change of advisor on your time to complete the degree. Coursework, qualifying exam(s), and the research proposal examination are all factors that could be impacted with a change in advisor.
   c. Your current and future funding.
   d. Research already conducted. Whether this will be incorporated into the dissertation, thesis, or report, and if so, how.
   e. Impact on immigration status (if any). Consult International Programs and Services (IPS), if necessary.
3. Record the agreement from the discussions in writing, including indications of agreement from all affected faculty advisors. The Graduate Program Director will ensure that copies of this written agreement are provided to you and all affected faculty advisors.
4. File an updated Advisor and Committee Recommendation Form for approval by the Graduate School.
5. If you and the Graduate Program Director are unable to reach agreement on the advisor change, contact the Assistant Dean of the Graduate School to determine additional steps to resolve the situation.

If a situation arises in which the relationship between you and your research advisor is terminated and you have not yet identified a new advisor, the Graduate Program Director may serve as a temporary advisor for one semester. At the end of that semester, you must identify a new research advisor, switch into the coursework-only track of the MS program, or leave the program.

2.21   Advisory Committees

The purpose of the advisory committee is to provide advice and consultation at all stages of producing the thesis or dissertation, particularly in the development of the proposal.

2.21.1   Selecting a Committee

You should work with your advisor(s) to select members of your examination committee.

MS thesis committees must include of at least 3 members of the graduate faculty, including the primary advisor.

PhD committees must consist of at least 4 members of the graduate faculty, including the primary advisor. Two committee members should be from the ACSHF program.

For both MS and PhD committees, at least one member must be from <u>outside of the Department of Cognitive and Learning Sciences</u>. Affiliated and Adjunct CLS faculty may serve as external committee members if they are not also serving as a co-advisor.

You must select your committee prior to proposing your thesis or dissertation using the *Advisor and Committee Recommendation* form. The Dean of the Graduate School will appoint the committee.

2.21.2   Changing a Committee

Changes to your Advisory Committee should be made in consultation with your primary research advisor.

3 Master's Programs

The Master's program in ACSHF requires a *minimum* of 30 credit hours of graded classes. With the permission of the Graduate Program Director, you may take up to a maximum of 9 credits at the 3000/4000 level.

All MS students will take core classes in three main areas: human factors, cognitive science, and research methods and statistics.

3.1 Graduate Course Schedule and Timeline

Students will be able to complete their masters-level coursework in two calendar years. We offer the four required courses in sequence, alternating in "A" years and "B" years. 2019-20 is an "A" year and 2020-21 is a "B" year. Students who wish to complete their MS degree within 2 years should plan to take these courses is this sequence, as each course is only offered every other year.

Table 1. Sequence of required courses

Year	Fall	Spring
A	PSY 5850: Human Factors Psychology	PSY 5100: Applied Cognitive Science
B	PSY 5210: Stats I	PSY 5220: Stats II or alternative

Students in the MS Thesis program should expect to complete the program in 4-5 semesters.

Table 2. Typical milestones in the MS Thesis program and typical timeframes in which they are completed.

What:	When (semesters):
Choose a research advisor	Upon acceptance
Choose a committee	1 to 2
Propose MS Thesis	2 to 3
Thesis Defense	4 to 5

3.2 MS Tracks

There are three tracks through the MS degree program:

- **Coursework Track**: The coursework track is designed for students who are interested in a human factors career in industry. Students in this track will work with the Graduate Program Director to identify a selection of classes best suited for their personal career goals.
- **Accelerated Coursework Track**: The accelerated version of the coursework track allows current Michigan Tech undergraduate students with a major or minor in Psychology to complete the MS degree in one additional year.

- **Thesis Track:** The thesis track is designed for students who plan to pursue a PhD or who are interested in a research-based career in industry or government.

3.3 Coursework Track Requirements

Students in the Coursework Track must complete the following requirements:

Table 3. Coursework Track Requirements

Human Factors Core (6 credits)	Cognitive Science Core (6 credits)
● PSY 5850: Human Factors And one of the following[*]: ● PSY 4015/5015: Cognitive Task Analysis ● PSY 5860: Human Factors II ● CS4/5760: Human Computer Interaction and Usability Testing	PSY 5100: Applied Cognitive Science And one of the following[*]: PSY4/5010: Cognitive Psychology PSY 4/5160: Sensation & Perception PSY 5170: Attention PSY 4/5510: Learning & Memory PSY 4/5750: Judgement and Decision Making PSY 5450: Cog. and Motor Aging PSY 4060: Cognitive Neuroscience EH4400: Motor Learning & Control EH5530: Advanced Motor Behavior
Statistics and Research Methods Core (6 credits)	**Electives (12 credits)**
● PSY 5210: Adv. Statistical Analysis and Design I And one of the following[*]: ● PSY 5020: Research Methods ● PSY 5220: Adv. Statistical Analysis and Design II ● PSY 5390: Testing Meas. & Adv. Psychometrics ● PSY 6990: Survey & Meta-analytic Methods ● PSY 5780: Qualitative Research Methods	Electives may be selected from one of the three core areas, other classes in the ACSHF course catalog, or other departments on campus, with approval by the Graduate Program Director.
[*]Other classes may be approved with permission of the Graduate Program Director.	

3.4 Accelerated Coursework Track Requirements

Students in the Accelerated Coursework Track must complete the course requirements listed in Section 4.4 for the Coursework Track; however, they may double count up to 6 credits from their undergraduate degree toward their 30-credit requirement.

If you are interested in the accelerated option, you should work with the Undergraduate Advisor and Graduate Program Director to develop a personalized course plan during your Junior Year. Due to the 4-semester sequence of classes, you may need to take 3-6 credits of graduate coursework during your Senior year to ensure your ability to complete the program in only one additional year. These classes can be taken under Senior Rule and would be in addition to the 6 credits of double-counted undergraduate coursework.

3.5 Thesis Track Requirements

Students in the Thesis Track must complete the following requirements:

Table 4. Thesis Track Requirements

Human Factors Core (9 credits)	Cognitive Science Core (9 credits)
PSY 5850: Human Factors And two of the following*: ● PSY 4015/5015: Cognitive Task Analysis ● PSY 5860: Human Factors II ● CS4/5760: Human Computer Interaction and Usability Testing	PSY 5100: Applied Cognitive Science And two of the following*: PSY4/5010: Cognitive Psychology PSY 4/5160: Sensation & Perception PSY 5170: Attention PSY 4/5510: Learning & Memory PSY 4/5750: Judgement and Decision Making PSY 5450: Cog. and Motor Aging PSY 4060: Cognitive Neuroscience EH4400: Motor Learning & Control EH5530: Advanced Motor Behavior
Statistics and Research Methods Core (6 credits)	**Thesis Research (6 credits)**
● PSY 5210: Adv. Statistical Analysis and Design I ● PSY 5220: Adv. Statistical Analysis and Design II	PSY 5999: Thesis Research
*Other classes may be approved with permission of your Research Advisor and the Graduate Program Director.	

3.6   Thesis

All MS Thesis students are required to submit a thesis. It should demonstrate your capacity to carry out independent research and provide you with the opportunity to contribute to ACSHF science. While working on your thesis proposal and/or collecting data, you can enroll in PSY 5999: Thesis Research. Note: Thesis Research credits taken beyond the 6 required **may *not* be counted toward future PhD credit requirements** unless prior permission is obtained from both your advisor and the Graduate Program Director.

 3.6.1   Thesis Proposal

The thesis proposal is comprised of two parts, a written document and a presentation of your proposal to your thesis committee.

Proposal Document. Your proposal document should include three parts: a) an executive summary of your proposed project, b) annotated bibliographies with at least 25 references, and c) a timeline for your completion of the project with tasks and deadlines.

The executive summary should be no more than 2 pages in length (single-spaced, 12-point font, 1-inch margins) and address the following questions: what problem does your research address?, why is this problem important/significant?, what have others done?, and what are you doing? You are not required to collect pilot data prior to proposing your thesis project.

After approval by your advisor, your thesis proposal document should be submitted to your committee no less than two weeks prior to the date of the proposal presentation.

Proposal Presentation. You are responsible for coordinating with your committee members to schedule your presentation date and location. Your proposal presentation is open to Michigan Tech faculty members outside of the committee who may wish to attend. If you wish, you may also invite the ACSHF graduate students or open your proposal to the public. You should advertise your proposal meeting to relevant parties at least one week in advance.

Your presentation should be 30-45 minutes long. It should include a brief overview of your executive summary to motivate your project, but focus primarily on your proposed research methods. Your presentation should also include a discussion of your intended analyses, expected results, and timeline for completion.

Following your presentation, the audience (if any) will have an opportunity to ask questions and then will be dismissed for a closed session including only you and your committee. The closed session is typically 60 minutes in length. No forms are required for the thesis proposal meeting.

3.6.2 Thesis Research Preparation & Submission

Procedures for formatting, preparing and submitting a thesis can be found on the [Graduate School website](#).

The thesis should contain a review of the literature, including problem statement/rationale, hypotheses, methods, results from data and statistical analyses, discussion, conclusion, references, and appendices. You should work with your advisor to refine the thesis as much as possible in terms of content, grammar, and format. *Your advisor should sign off on the final draft of your thesis before you submit it to your committee.* You should check with your advisor for how much time he or she will need to review your manuscript before submitting to your committee. The submission to the committee should be your best estimation of a final product.

You must submit your final draft to your committee and to the Graduate School no less than <u>two weeks</u> prior to the planned date of the Thesis Oral Presentation and Defense. You must also submit your [Pre-defense Form](#) to the Graduate School.

If these two items are not in the Graduate School two weeks prior to the defense, the defense will be cancelled, and you will need to begin the scheduling process again.

The Graduate School will review your draft report and provide feedback via the [*TDR-Review Form*](#).

3.6.3 Oral Presentation & Defense of the Thesis

You are required to present an oral defense of your final thesis to your committee. It is your responsibility to coordinate with committee members to schedule the final thesis presentation and defense. You should schedule the defense a minimum of one month in advance to ensure the availability of all committee members. Your ACSHF faculty advisor will serve as the chair of

your presentation and defense. Be sure to discuss the procedure with your advisor. In general, the thesis presentation should be concerned with the problem, design, method, interpretation, and knowledge in the general area of the dissertation. The public presentation should last no longer than 45 minutes and should be accessible to an audience of educated non-experts. A closed forum and defense will follow for an additional 60-120 minutes including questioning and review. Only members of the committee and the defending student will be allowed in the closed session.

The committee reports the results of the final oral examination by completing the Report on Final Oral Examination form. You should submit this form immediately following the oral defense.

If you do not successfully complete the oral exam in two (2) attempts, the Graduate Program Director will request that the Dean of the Graduate School dismiss you for lack of progress.

The committee approves the final dissertation by completing the Approval of a Final Dissertation, Thesis, or Report Form. You should submit this form only after you have completed all of the technical and formatting changes required by the committee, and within one week of submitting the final thesis or report to the Graduate School.

3.7   Forms and Deadlines

It is your responsibility to meet all paperwork deadlines to ensure the timely completion of your degree. Detailed degree completion timelines for the MS degree (coursework/thesis) are available on the Graduate School website. You can check the Current Students area of MyMichiganTech for a detailed checklist of required items and to see a list of items that are complete or pending. Table 5 contains typical due dates and common forms associated with key milestones in the MS Program.

Table 5. Common Forms in the MS Program

Approximate Deadline	Form
First semester (upon arrival to campus)	Advisor and Committee Recommendation Form (to name advisor)
Second or third semester	Advisor and Committee Recommendation Form (to name committee)
Semester before graduation	Degree Schedule
Semester of graduation	Degree Completion Form
Semester of graduation (if you plan to participate)	Commencement Application Form
Two weeks before your defense	Pre-defense form and submit completed thesis draft
Day of defense	Report on Final Oral Examination
After defense	Approval of Dissertation, Thesis, or Report
After submitting Approval of Dissertation, Thesis, or Report Form	Submit thesis to Digital Commons and ProQuest
Final week of final semester	Exit Survey
Before you leave campus	Graduate student workspace cleanout

4   Doctor of Philosophy

4.1   PhD Requirements

The Doctoral program in ACSHF requires a minimum of 70 credit hours, including core courses, elective courses, and required research as follows:

- 30 hours of Core Graduate Credit (See Section 4.6)
- 30 hours of Elective Graduate Credit including:
    - 9 credits of coursework
    - 21 additional credits comprised of any combination of practicum credits, elective coursework, independent research credits, and/or dissertation research credits (beyond the 10 required).
- 10 hours of Dissertation Research Credit

Once you have completed your 30 credits of Core Graduate Coursework, 9 credits of course-based Elective Graduate Credit, and your practicum, you are eligible to submit your qualifying examination portfolio. After successfully passing your qualifying exam, you will obtain doctoral candidacy status and can officially form your dissertation committee.

4.2   Coursework Requirements

In addition to the coursework listed in Section 4.6, you must also take a minimum of 9 credits of graded coursework. These elective courses can be selected from the ACSHF graduate course catalog or from another department on campus, with the approval of your advisor and the Graduate Program Director.

4.3   Thesis Requirements

Unless otherwise specified, students not holding a Master's degree prior to enrollment in the doctoral program should elect to receive a Master's degree en route to PhD.

4.4   Requirement Waivers

If you enter the PhD program with a Master's degree, you should work with your advisor and the Graduate Program Director to determine which, if any, credits can be waived. Students who enter the PhD program with a MS (with thesis) in psychology, human factors, or a related area typically have 12-15 credits waived, including the thesis requirement. During your first semester, you should provide copies of your transcripts and thesis to the Graduate Program Director for evaluation. If this leads to questions about the sufficiency or quality of prior coursework or documents, the Director will consult the Graduate Program Committee to evaluate. If the documents provided are not written in English, students must elect one of the following: (1)

provide a translated version of the document to the program committee; (2) allow external review by at least two scientifically-qualified reviewers who can read the language it is written in and provide an English-language review of the competency. Candidate reviewers will be selected to avoid conflicts of interest, and written reviews will be confidential and not provided to the student; or (3) give an English-language presentation to describe and explain the results and methods of the research (this can be in a public forum or a presentation for the Graduate Program Committee and Graduate Program Director). Based on the option taken, the Graduate Program Committee will make a recommendation to the Graduate Program Director.

PhD students who do not wish to receive a Master's degree must submit a research report, previously-written Master's thesis, publication submission, or published manuscript covering research conducted during master's-level study in ACSHF or a closely-related field to the ACSHF Graduate Program Committee for evaluation, typically prior to or as part of their qualifying exam (qualifying exam binder) process. In all cases, the thesis or report should be the culmination of a research project that is closely related to his/her area of specialization, and be a professional representation of the student's work, the advisor, program, and university. The final product should demonstrate the student's capacity to carry out independent research and should provide the student with the opportunity to contribute to knowledge in ACSHF.

4.5   Practicum Requirement

The practicum requirement is an independent activity wherein you will (1) apply existing ACSHF knowledge and skills and (2) acquire new knowledge, skills and methods from the operational setting in which the practicum activity takes place. You should choose your practicum activity in consultation with your advisor.

The practicum activity must be approved, in advance, by the ACSHF Graduate Program Committee.

The practicum is designed to help ensure all ACSHF scientist-practitioners are well-prepared to identify, define, and solve applied problems. Your practicum should provide experience using methods that are not part of your core research and allow for the development of expertise in the application of Human Factors methodology to real world operational problems. It must integrate (a) problem definition (e.g., through task analysis, error analysis, or operational analysis), (b) the design of experiments or the design of system, (c) the statistical analysis and interpretation of data, and (d) the presentation of the results to stakeholders. Appropriate supervision of relevant practical experiences is required. The practicum activity may be paid or unpaid.

Suggestions on how to meet this requirement include:

- Structured internships in the private or public sector.
- Formal or informal cooperative assignments in the private or public sector.

- Work on projects that take place within the university environment, but that have an external "user" who has a need for a solution to a problem involving human factors (e.g., working outside of the department/lab to solve operational problems for the university).
- Practicum assignments in extra-university organizations (e.g., government or other institutes).

Alternatively, students may seek approval to submit a patent or write a publishable design-based article that emphasizes the practical applications of their research (e.g., to Ergonomics in Design or other similar design/application-based outlet).

Relevant work, design and/or applied experience prior to enrollment in the ACSHF program may also fulfill this requirement with the approval of the ACSHF Graduate Program Committee and the Graduate Program Director.

To ensure that your proposed practicum will satisfy the intent of this requirement, you should prepare and submit a [Practicum Proposal](#) for review and approval by your advisor and the Graduate Program Committee prior to starting the project or course. If your advisor is on the Graduate Program Committee, one more committee member is required to evaluate the practicum proposal.

You are encouraged, but not required, to enroll in PSY 5095 Practicum during the semester of your practicum. All credits of PSY 5095 will count towards the *Elective Graduate Credit* requirement.

4.6   Qualifying Examination Portfolio

The purpose of the Qualifying Examination Portfolio is to demonstrate your preparation for candidacy in the ACSHF program, as well as your ability to communicate this information.

Your digital portfolio must be a high-quality representation of your professional preparation as an independent researcher and suitable for presentation to external stake-holders (e.g., review by accreditation committees, presentation to industry collaborators).

4.6.1   Portfolio Contents and Format

Your portfolio should include a discussion and curated evidence of your competencies in five essential skill areas: Independent Research, Statistical Skills, Research Funding, Research Presentation, and Practical Skills.

The portfolio should conform to APA publication manual (6th ed.) guidelines for writing a manuscript and contain the following material:

- A general overview and introduction (5-page maximum)
- Five essays, each corresponding to a competency area (25-page maximum)

- An up-to-date CV
- Organized appendices including evidence of your competency in all five areas
- The *Agreement to Release Qualifying Exam Portfolio* Form.

4.6.2 Overview and Introduction

The portfolio should begin with a general overview and introduction describing your skills, key achievements, and career plans. In no more than five pages, you should address each of the following questions:

- What is your official specialization and what are your major achievements and essential skills in that area?
- What can an expert in your sub-specialization do that other people cannot do (or cannot do as well), and how or why is this type of skill valuable/useful?
- How have your educational and professional experiences prepared you to contribute to your field?
- How have you prepared yourself to support inclusion and diversity?
- How have you prepared yourself to facilitate teamwork and communication?
- How have you prepared yourself to conduct ethical human subjects research?
- What is the general topic of your dissertation and (briefly) why is this an interesting topic that connects basic and applied science? (not required but strongly recommended when the topic is known)
- What will you do with your expertise in the coming years? What are your professional career goals? (e.g., professor at a teaching or research university, professional in a specific industry, government contractor, etc.)

4.6.3 Essays

For each essential competency, you should prepare a brief essay (5-page maximum) with supporting materials included in appendices. In each essay you should discuss concrete examples that represent your preparation in each area; you should not include all tangentially-relevant experiences or repeat examples across essays.

In most cases, you should be able to demonstrate your competency by briefly citing projects, presentation, publications, classes, etc. in a short list or description (e.g., I have co-authored 2 conference papers and 5 posters) and then discussing a single paper/presentation/project/experience in depth to demonstrate how you have put that skill into practice. It is perfectly acceptable to demonstrate your competency in one area through a single experience or work product. Multiple exemplars are encouraged only to the extent that they are necessary to demonstrate your competency in that area.

Some students come into the ACSHF graduate program with significant prior experience in academia or industry. While it is acceptable to note these experiences in demonstrating your

competency in one or more areas, your portfolio should emphasize your preparation through the ACSHF program. You should only rely on past work if there is a gap in your skills while at Michigan Tech, and it was reasonable because you had strong experience in that area prior to this program.

The following sections provide detailed discussion of what constitutes relevant evidence of each competency and specific instructions for each of the five essays. You are encouraged to discuss and review your essays and qualifications with your advisor or any member of the Graduate Program Committee before submission.

4.6.4   Independent Research Skills

PhD candidates should be qualified to lead independent research and should have substantive experience at all major research stages in their area of specialization, including:

a) Problem identification and literature review
b) Design, ethical review, and research approval
c) Data collection, analysis, and interpretation
d) Manuscript preparation, revision, and submission

The short essay should describe your preparation and qualifications in your area of research specialization, including evidence of research skills at each of the stages described above. The goal of this essay is to provide an honest evidence-based account of your experiences and the skills that qualify you to lead independent research in your area of specialization.

Clear evidence of being qualified to lead independent research includes having already led independent research that resulted in a high-quality manuscript submitted for peer-review and publication (i.e., submitted but not necessarily accepted) or substantive roles in research leading to technical reports, peer-reviewed proceedings papers, high-quality book chapters, and related scholarship activities. A first-author publication/submission is not required to demonstrate this competency. Statements from collaborators or co-authors certifying your independent contributions may be included in the appendix. While important, research poster presentations and related dissemination activities are not sufficient evidence of independent research skills.

4.6.5   Statistical Skills

A professional researcher must have the ability to conduct both basic and advanced statistical analysis on behavioral and other data. Your essay should document your training (e.g., coursework, workshops, etc.), identify the breadth of your statistical competency (e.g., identifying tools and methods they have used), and describe how you have applied an advanced statistical method in a research, design, or coursework project (not conducted as part of a course in statistics). We recommend that you demonstrate your statistical competency using the following template:

1. List all relevant coursework, workshops, and formal education in statistical and data analysis skills.
2. Identify the primary statistical, programming, data analysis, and modeling tools and methods for which you have experience or proficiency (i.e., software such as SPSS, R, python; methods such as regression, ANOVA, social network analysis, particular computational models, etc.)
3. A brief account of the projects (published, underway, etc.) to which they have applied these skills. A bullet list is sufficient.
4. A sample evidence from a manuscript, report, publication, or conference presentation in which these skills were exercised outside of the classroom. This could include results sections of a paper, analysis script/code, raw data analysis output, or other materials showing the process or product of statistical thinking.

4.6.6   Research Funding Skills

PhD candidates should be qualified to prepare high-quality proposals for research funding in their area of specialization. The short essay should provide an honest evidence-based account of your experiences and the skills that qualify you to prepare high-quality research funding proposals in your area of specialization.

Clear evidence of being qualified to prepare research-funding proposals includes having already prepared and submitted one or more proposals (e.g., contracts, grants, fellowships; submission is recommended but not required). A fellowship-type grant application or grant proposal as a course requirement can provide evidence of qualification if they are comparable to a regular request for proposals (RFP) or broad agency announcement (BAA). Students who are co-investigators (formally or informally) on a research funding proposal within their area of specialization must present evidence of their substantive role in the proposal development and writing. Statements from principal investigators that certify your independent contributions and other supplemental materials should be included in your appendices.

4.6.7   Presentation Skills

Professional researchers need to be able to present their research results to peers, research sponsors, and other professional researchers. The short essay should describe how you have prepared yourself for making such presentations. Students should provide evidence of this preparation, including major presentations at regional, national, or international conferences, and experience as a certain type of instructor (e.g., undergraduate course or outreach programs). *Typically, a combination of poster presentations and oral presentations at a mixture of local and national venues will satisfy this requirement.* Unless it is important to establishing your skills in this area, you should not include a discussion of presentations made as part of your graduate coursework. You do not need to include slide decks for all of your presentations in the appendix.

4.6.8 Practical Skills

PhD candidates should be qualified to apply their knowledge and skills to real world problem solving. In this essay, you should provide an honest evidence-based account of your experiences and the skills that qualify you to be a Human Factors practitioner in your area of specialization. Clear evidence of being qualified to be a Human Factors practitioner includes completion of an approved internship, design project, enterprise-type project, or consultancy project via PSY 5095 (see Section 5.5: Practicum Requirement). Your essay should include a description of and reflection upon your practicum experience(s) and should focus on skills you obtained through that experience that are relevant specifically for a ACSHF professional. A signed copy of your Practicum Proposal and a report or letter of support from your practicum advisor should be referenced in your essay and included in the Appendix.

Although not required, in this section you may also briefly discuss your competencies with ACSHF-specific techniques and skillsets (e.g., eye tracking, driving simulator, EEG, CTA, usability techniques, specialized software/hardware, motion capture/movement analysis, robotics, app development, data modeling, project management, programming languages, etc.). However, any additional competencies that you report must not be discussed elsewhere in your portfolio and must be relevant to work as an ACSHF Professional. For example, if you use Eye-tracking or EEG for your own research, it would be part of the Independent Research and not be in this section. General lab skills, writing, data handling, and teaching experience should not be discussed here.

4.6.9 Curriculum Vita

Include your CV in the body of the portfolio or in the appendix. You may refer directly to your CV in your essays; you do not need to duplicate material from your CV in your essays or other appendices.

4.6.10 Appendices

The appendix should include evidence of your competencies in each of the five areas. Appendices should be clearly labeled and include page numbers and captions to allow the reader to easily find and interpret material referenced in the essays.

4.6.11 Agreement to Release Qualifying Exam Portfolio

You should include a copy of the *Agreement to Release Qualifying Exam Portfolio* at the end of your portfolio. Declining to allow the portfolio to be released will not impact the evaluation of the exam, but is necessary because of educational confidentiality.

4.6.12 Portfolio Submission

You should submit your portfolio to your advisor for initial review and approval. Upon approval of your advisor, final materials may be submitted for review to the ACSHF Graduate Program Committee Chair (not the Doctoral Dissertation Examination Committee). A copy should also be forwarded to the Graduate Program Director. Electronic submissions are required. During the normal academic year (fall and spring), under typical conditions, the committee members will review the qualifying exam within one month of submission and make a decision.

4.6.13 Portfolio Review Process

Your primary research advisor and The ACSHF Graduate Program Committee will review the qualifying exam binder and meet in a closed session to discuss grading and issue a decision. Your advisor will be part of this meeting to answer any questions the committee might have. If your advisor currently serves as a member of the ACSHF Graduate Program Committee, the committee will nominate one additional tenure-track faculty member to serve as part of the review process, which will normally involve a total of four reviewers (your advisor and three others). At the start of an evaluation process, the ACSHF Graduate Program Committee or your advisor may request additional information (e.g., if documents are missing or more detailed supplemental materials are useful).

To pass the qualifying exam, the students must meet or exceed all requirements. In some special cases, demonstrated excellence in four areas may compensate for some weakness in a fifth area.

The Graduate Program Committee will provide an assessment of pass, minor revisions required, or fail:

- **Pass:** The Qualifying Exam Portfolio meets or exceeds the expectations of the committee members; it is of high quality and no changes are required. Committee members may provide comments and suggestions.
- **Minor Revisions Required**: The Qualifying Exam Portfolio must be revised and re-reviewed. Committee members will provide a list of the specific issues of concern that will need to be addressed by the student before the portfolio will be re-reviewed. The committee may request or require a full review or only a review by the Committee Chair (student's advisor) as determined by the committee at the time of initial student feedback (i.e., the decision).
- **Fail:** The Qualifying Exam Portfolio does not meet the goals described above. Extensive revision is required or may not be possible without first developing new skills and collecting new evidence of competencies.

All members of the committee will provide supporting comments to the Graduate Program Committee Chair. The Chair or designee will integrate the comments and determine if consensus has been reached (i.e., via formal in person vote during the meeting). The decision about the qualifying exam grade will be based on the majority opinion of the committee

members. In the event of a dissenting minority, the committee will work to provide constructive written feedback including discussion of the major concerns by the dissenting faculty member. In the event the committee cannot come to consensus on the specific feedback, the Graduate Program Director or the Chair of the department will be consulted.

Regardless of the assessment, the Graduate Program Committee Chair (or member) will draft a written response that will be reviewed by all committee members to ensure that the contents accurately reflect the committee's views. A copy of this response will be given to you, your advisor, and the Graduate Program Director.

Normally, if revisions are required, you will have one month from the date of initial notification to address concerns and revisions. If you have questions about the revisions, you are encouraged to meet with your advisor, the Graduate Program Committee Chair, and/or individual committee members. Your revised Qualifying Exam Portfolio should be accompanied by an explanation of how (and on what pages) the issues were addressed, including a brief summary of all changes that were made. Within one month, the revision will be graded as Pass/Fail.

After successful completion of the qualifying examination process, complete the *Report on Qualifying Examination.* This form must be submitted before you can propose your dissertation.

4.6.14   Timeline

Successful completion of the qualifying examination portfolio should occur within two semesters of the completion of all coursework and at least two semesters prior to the final oral doctoral dissertation defense. If you do not successfully pass your qualifying examination on the first attempt, you will be allowed one more opportunity to do so. If you do not successfully pass the qualifying examination portfolio evaluation in *two (2)* attempts, the program director may request that the Dean of the Graduate School dismiss you from the university for lack of progress.

4.7   Doctoral Dissertation and Final Oral Examination

All PhD students are required to submit a Doctoral Dissertation. It should demonstrate your capacity to carry out independent research and should provide you with the opportunity to contribute to knowledge in ACSHF. Students working on their dissertation proposal and/or collecting pilot data in preparation for their dissertation can enroll in PSY 6999: Dissertation Research. Dissertation Research credits beyond the 10 required may count toward the 30 hours of Elective Graduate Credit.

4.7.1   Dissertation Proposal

You must complete all of your coursework and receive final approval on your qualifying examination portfolio before you can propose your dissertation.

The dissertation proposal is comprised of two parts, a written document and a presentation of your proposal to your dissertation committee.

Proposal Document. Your proposal document should be generally structured like a dissertation (see 5.7.2) and conform to APA publication manual (6th ed.) guidelines for writing a manuscript. To adequately motivate and describe a multi-study dissertation project, a typical proposal may require 30-50 pages excluding the cover page, table of contents, and reference section. There is not, however, a strict minimum or maximum page requirement.

The first chapter(s) of your proposal should motivate your dissertation project. You should describe your research problem, explain why this problem is relevant and important, state your specific research questions, briefly discuss what you plan to do, and review the relevant literature. The breadth and depth should be similar to the introduction and literature review of a grant proposal. Synthesize the relevant literature to make a case for your dissertation; do not simply review everything you have read.

Next, there should be one chapter for each component of your dissertation project (e.g., Experiment 1, 2, 3). A chapter describing a typical laboratory experiment may include a brief discussion of the literature relevant to that specific experiment, hypotheses, an overview of the research methods, and expected or actual results. The exact format and content of these chapters should be informed by the nature of your specific project. The importance of having completed one or more studies prior to proposing should be determined in consultation with your advisor and committee. Collecting data prior to your proposal meeting is neither explicitly required, nor discouraged.

The last chapter of your proposal should include a timeline for completing your dissertation.

After review and approval by your advisor, your dissertation proposal document should be submitted to your committee no less than <u>two weeks</u> prior to the date of the proposal presentation.

Proposal Presentation. You are responsible for coordinating with the committee members to schedule your presentation date and location. Your proposal presentation is open to individuals outside the committee who may wish to attend (i.e., public) and should be advertised via the department listserv at least one week in advance.

Your presentation should be between 30 and 45 minutes long. It should include a brief review of the literature and your work to date. The majority of your presentation should focus on your proposed methods, analysis, and expected results.

Following your presentation, the audience will have an opportunity to ask questions and then will be dismissed for a closed session including only you and your committee. The closed session is typically 60-90 minutes in length. Once your committee has accepted your Dissertation Proposal, you must complete the *Report on Research Proposal Examination Form* (See Appendix).

4.7.2   Dissertation Research Preparation & Submission

Procedures for formatting, preparing and submitting a Doctoral Dissertation can be found on the Graduate School website.

The dissertation should contain a review of the literature, including problem statement/rationale, hypotheses, methods, results from data and statistical analyses, discussion, conclusion, references, and appendices. You should work with your advisor to refine the dissertation as much as possible in terms of content, grammar, and format. Your advisor should sign off on the final draft of your dissertation before you submit it to your committee. The submission to the committee should be your best estimation of a final product.

You must submit your final draft to your committee and to the Graduate School no less than two weeks prior to the planned date of the Dissertation Oral Presentation and Defense. You must also submit your Pre-defense Form to the Graduate School.

If these two items are not in the Graduate School two weeks prior to the defense, the defense will be cancelled, and you will need to begin the scheduling process again.

The Graduate School will review your draft report and provide feedback via the *TDR-Review Form*.

4.7.3   Oral Presentation & Defense of the Dissertation

You are required to present an oral defense of your final dissertation to your committee. It is your responsibility to coordinate with committee members to schedule the final dissertation presentation and defense. You should schedule the defense a minimum of one month in advance to ensure the availability of all committee members. Your ACSHF faculty advisor will serve as the chair of your presentation and defense. Be sure to discuss the procedure with your advisor. In general, the dissertation presentation and defense should be concerned with the problem, design, method, interpretation, and knowledge in the general area of the dissertation. The public presentation should last no longer than 45 minutes and should be accessible to an audience of educated non-experts. A closed forum and defense will follow for an additional 60-120 minutes including questioning and review. Only members of the committee, Michigan Tech faculty, and the defending student will be allowed in the closed session.

The committee reports the results of the final oral examination by completing the Report on Final Oral Examination form. You should submit this form immediately following the oral defense.

If you do not successfully complete the oral exam in two (2) attempts, the Graduate Program Director will request that the Dean of the Graduate School dismiss you for lack of progress.

The committee approves the final dissertation by completing the Approval of a Final Dissertation, Thesis, or Report Form. You should submit this form only after you have completed all of the

technical and formatting changes required by the committee, and within one week of submitting the final thesis or report to the Graduate School.

4.8   Timeline for Completion

Most students complete their PhD in Applied Cognitive Science and Human Factors within 5-6 years. Motivated students who come into the program with a related MS degree can complete the program in as little as 3.5 years.

The table below shows some typical milestones for the ACSHF program, and indicates a typical range of times by which you should reach that milestone.

Table 6. Typical milestones in the ACSHF PhD program and typical timeframes in which they are completed.

What:	When (semesters):
Choose a research advisor	Upon acceptance
Complete required coursework	4 to 6
Pass qualifying exam	5 to 7
Choose a committee	5 to 7
Pass research proposal examination	6 to 8
Enter Candidacy	6 to 8
Dissertation Defense / Final Oral Examination	8 to 12

4.9   Forms and Deadlines

It is your responsibility to meet all paperwork deadlines to ensure the timely completion of your degree. Detailed degree completion timelines for your dissertation are available on the Graduate School Website. You can check the Current Students area of MyMichiganTech for a detailed checklist of required items and to see a list of items that are complete or pending. Table 7 contains typical due dates and common forms associated with key milestones in the PhD Program. (See Section 4.6 for due dates and forms associated with completion of the MS thesis on your way to a PhD.)

Table 7. Common Forms in the PhD Program

Approximate Deadline	Form
First semester (upon arrival to campus)	Advisor and Committee Recommendation Form (to name advisor)
Immediately after passing your qualifying exam	Report on Qualifying Examination
After passing your qualifying exam and select your committee	Advisor and Committee Recommendation Form (to name committee)
Immediately after passing your dissertation proposal	Report on Research Proposal Examination
One week before semester you want to reach candidacy	Petition to Enter Candidacy
Semester before graduation	Degree Schedule
Semester of graduation	Degree Completion Form
Semester of graduation (if you plan to participate)	Commencement Application Form
Two weeks before your defense	Pre-defense form and submit completed thesis draft
Day of defense	Report on Final Oral Examination

After defense	Approval of Dissertation, Thesis, or Report
After submitting Approval of Dissertation, Thesis, or Report Form	Submit thesis to Digital Commons and ProQuest
Before completing degree	Survey of Earned Doctorates
Before completing degree	Exit Survey
Before you leave campus	Graduate student workspace cleanout