

**Robotics Institute / School of Computer Science**

# **Graduate Student Handbook**

**Academic Year 2023-2024**

*Robotics Ph.D. Degree Program*

Last revision date: August 2023

The information contained in this graduate handbook focuses on the resources and locations available at the Carnegie Mellon Pittsburgh Campus.

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# 1 Welcome

We are proud of the open, friendly culture that has been the hallmark of the Robotics Institute since its inception. Faculty keep their office doors open to encourage informal meetings with students and colleagues. Graduate students organize department-wide social activities, ranging from Friday afternoon get-togethers to rock climbing trips. And the department's strong support for collaboration creates an ideal environment for world-class robotics research.

The Robotics Institute is an intellectually diverse, multi-disciplinary department. The Institute's faculty and students come from a wide variety of backgrounds and represent many unique areas of expertise. This diversity stems from the multi-disciplinary nature of the robotics, which encompasses aspects of computer science, mechanical engineering, electrical engineering, psychology, and many other disciplines.

The Robotics Institute is an international leader in robotics education. The world's first Robotics Ph.D. program was founded here in 1988 with the goal of providing graduate students with the knowledge, experience, and skills to become the next leaders in robotics research and education. Graduates from the Ph.D. program have taken on roles ranging from faculty in top universities, to designing and controlling Mars rovers, to develop self-driving cars.

Since the start of the Robotics Ph.D. program, we have steadily grown and expanded our programs of study. Today, we offer diverse opportunities at all levels of education - from masters programs and an undergraduate minor to K-12 where our renowned programs, workshops, and summer classes inspire and educate the next generation of roboticists.

Even when robotics technologies were relatively primitive, their ability to boost the productivity and stature of the United States was foreseen in the evolving global marketplace. The Robotics Institute at Carnegie Mellon University was established in 1979 to conduct basic and applied research in robotics technologies relevant to industrial and societal tasks. Seeking to combine the practical and the theoretical, the Robotics Institute has diversified its efforts and approaches to robotics science while retaining its original goal of realizing the potential of the robotics field.

## 2 Vision and Mission

### 2.1 Vision

Carnegie Mellon University will have a transformative impact on society through continual innovation in education, research, creativity, and entrepreneurship.

### 2.2 Mission

*To create a transformative educational experience* for students focused on deep disciplinary knowledge; problem solving; leadership, communication, and interpersonal skills; and personal health and well-being.

*To cultivate a transformative university community* committed to (a) attracting and retaining diverse, world-class talent; (b) creating a collaborative environment open to the free exchange of ideas, where research, creativity, innovation, and entrepreneurship can flourish; and (c) ensuring individuals can achieve their full potential.

*To impact society in a transformative way* — regionally, nationally, and globally — by engaging with partners outside the traditional borders of the university campus.

## 3 Degrees Offered

### **Doctor of Philosophy (Ph.D.) in Robotics**

The Robotics doctoral program is committed to preparing students to be world-class researchers, creating knowledge and artifacts that can impact our society. Graduates of the program will take a leading role in the research and development of future generations of integrated robotics technologies and systems.

### **Dual Degree Ph.D. Program in Robotics**

The educational offering of the CMU Portugal Program comprises world-class Dual Degree Ph.D. Programs and is committed to preparing students to be world-class researchers, creating knowledge and artifacts that can impact our society. Graduates of the program will take a leading role in the research and development of future generations of integrated robotics technologies and systems. The student will be awarded with a dual degree Ph.D. conferred by CMU and another by a Portuguese partner University. During the Ph.D., the student should comply with the regulations of both Universities.

### **Center for the Neural Basis of Cognition Option**

The Center for the Neural Basis of Cognition offers an interdisciplinary training program operated jointly with affiliated doctoral programs at Carnegie Mellon University and the University of Pittsburgh. The affiliated programs include Robotics, Computer Science, Psychology, and Statistics at Carnegie Mellon, and Mathematics, Psychology, and the Program in Neuroscience at the University of Pittsburgh.

Students must also be separately admitted to the CNBC program; they fulfill the same basic requirements as regular Ph.D. students in Robotics but have additional requirements to fulfill.

## **4 Using the Graduate Student Handbook**

*While this handbook is specific to your academic experience in the department, there are several other resources and offices graduate students are encouraged to consult during their tenure at Carnegie Mellon University. Information about The Word, the student handbook, the Office of the Graduate and Postdoctoral Affairs, the Office of the Dean of Students and others are included in Appendix A of this handbook.*

Students may request this handbook in a different format by contacting the Ph.D. Program Manager.

## **5 Carnegie Mellon University Statement of Assurance**

Carnegie Mellon University does not discriminate in admission, employment or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the university ombudsperson, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-1018. Obtain general information about Carnegie Mellon University by calling 412-268-2000.

Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault and fire safety policies, and containing statistics about the number and type of crimes committed on the campus, and the number and cause of fires in campus residence facilities during the preceding three years. You can obtain a copy by contacting the Carnegie Mellon Police Department at 412-268-2323. The annual security and fire safety report also is available online at [www.cmu.edu/police/annualreports](http://www.cmu.edu/police/annualreports).

Information regarding the applicable grievance procedures for alleged violations of the Statement of Assurance is available at <https://www.cmu.edu/policies/forms-and-documents/soa-violations.pdf>.

The Office for Institutional Equity and Title IX may be reached at 412-268-7125 or [institutionalequity@cmu.edu](mailto:institutionalequity@cmu.edu).

## **6 The Carnegie Mellon Code**

Students at Carnegie Mellon, because they are members of an academic community dedicated to the achievement of excellence, are expected to meet the highest standards of personal, ethical and moral conduct possible.

These standards require personal integrity, a commitment to honesty without compromise, as well as truth without equivocation and a willingness to place the good of the community above the good of the self. Obligations once undertaken must be met, commitments kept.

As members of the Carnegie Mellon community, individuals are expected to uphold the standards of the community in addition to holding others accountable for said standards. It is rare that the life of a student in an academic community can be so private that it will not affect the community as a whole or that the above standards do not apply.

The discovery, advancement and communication of knowledge are not possible without a commitment to these standards. Creativity cannot exist without acknowledgment of the creativity of others. New knowledge cannot be developed without credit for prior knowledge. Without the ability to trust that these principles will be observed, an academic community cannot exist.

The commitment of its faculty, staff and students to these standards contributes to the high respect in which the Carnegie Mellon degree is held. Students must not destroy that respect by their failure to meet these standards. Students who cannot meet them should voluntarily withdraw from the university.

The Carnegie Mellon Code can also be found on-line at:  
<https://www.cmu.edu/student-affairs/theword/>

## 7 University Policies and Expectations

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this departmental graduate student handbook the following resources are available to assist you in understanding community expectations:

- The Word/Student Handbook:  
<https://www.cmu.edu/student-affairs/theword//index.html>
- Academic Integrity Policy:  
<https://www.cmu.edu/policies/student-and- student-life/academic-integrity.html>
- University Policies Website:  
<https://www.cmu.edu/policies/>
- Office of Graduate and Postdoctoral Affairs:  
<https://www.cmu.edu/graduate/policies/index.html>
- Additional Policy Resources (e.g. college/department specific policies)

Due to the changing nature of conditions and expectations surrounding public health and safety requirements please visit <https://www.cmu.edu/coronavirus/> for the most up to date information.

Please see **Appendix A** for additional information about The Word and University resources.

## **8 Academic Calendar**

The Academic Calendar can be found at:

<https://www.cmu.edu/hub/calendar/index.html>

and provides information on all deadlines including registration dates, class start dates, add/drop deadlines, exam dates and more.

## 9 Departmental Information

### 9.1 Departmental Personnel

- [Martial Hebert](#), Dean of School of Computer Science
- [Matthew Johnson-Roberson](#), Director of the Robotics Institute
- [George Kantor](#), Associate Director of Education
- [David Wettergreen](#), Director of the Ph.D. Program
- [John Dolan](#), Director of the M.Sc. Robotic Systems Development
- [Michael Kaess](#), Director of the M.Sc. in Computer Vision Program
- [Dimi Apostolopoulos](#), Director of the Masters Program
- [Hartmut Geyer](#), Chair of the Graduate Program Committee
- [Katia Sycara](#), Associate Director for Faculty
- [Aaron Steinfeld](#), Head of Faculty Mentoring
- [Cheryl Wehrer](#), Associate Director for Finance and Administration
- [Barbara Jean Fecich](#), Manager, Academic Programs
- [Suzanne Muth](#), Graduate Program Manager
- [Sarah Conte](#), Academic Program Manager
- [Samantha Bridge](#), Senior Academic Coordinator
- [Jean Harpley](#), Senior Academic Services Officer
- [The Robotics Climate Committee](#)

Mission Statement: Prompted by historical evidence suggesting undue challenges in the experiences of various groups within RI, the mandate of this committee is to identify issues contributing to these obstacles and to make policy recommendations to the Director to address them.

List of Committee Members: Members were selected based on the pool of volunteers we received, mapped onto a representative demographic of our department of students, research staff, institute staff, and faculty.

- [Robotics Faculty](#)
- [Robotics Staff](#)
- [Connect with the RI Community](#)
- [SCS Committees](#)
- [SCS Dean's Ph.D. Advisory Committee](#)

- Work Life Resources for Students, Staff and Faculty

We are committed to focused action, open involvement, and transparency towards improving the experience of the current and future Ph.D. students in Carnegie Mellon University's School of Computer Science.

Graduate Student Department/College Ombudsperson

David Wettergreen, Dimi Apostolopoulos, and George Kantor serve as ombudspersons for graduate students to assist with difficult academic or personal situations where a confidential sounding board and/or an intermediary can be helpful. Examples of situations where students are encouraged to seek advice or assistance include:

- Difficulty in communications with advisor, particularly when those difficulties may lead to considering changing advisors or leaving the program
- Conflict with other group members that is difficult to resolve within the group
- Issues related to diversity or the departmental climate for those in groups who are historically underrepresented in science
- Personal concerns that interfere significantly with the ability to make timely progress in research or program requirements. These might be due to health, family or financial challenges
- Additionally, students may confer with the college liaison, Angela Lusk, [alusk@andrew.cmu.edu](mailto:alusk@andrew.cmu.edu), or the university graduate student ombudsperson, Amy Burkert, [ak11@andrew.cmu.edu](mailto:ak11@andrew.cmu.edu), on issues of process or other concerns as they navigate conflicts. Amy Burkert is the Vice Provost for Education.

## 9.2 Departmental Resources

Department Directory

Mail

The correct mailing address to use is: Your Name, The Robotics Institute, 4000 B Newell Simon Hall, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh PA 15213.

Meeting Owls, Phones, Jabber, and Printers

Conference & Classroom Audio/Video Support

CMU-Alert Emergency Notification System

RoboOrg

<https://roboorg.ri.cmu.edu/>

Robotics Institute graduate student organization. We are led-by and act in the interest of the RI grad student community by performing advocacy, organizing social events (ex. Post-Seminar Reception, Metaseminars), sponsoring student-organized activities, trips, and maintaining the RoboLounge.

While every RI grad student is part of (and RI affiliates are welcome too!) RoboOrg is a council of elected Officers handle leadership responsibilities. We highly encourage members of the community to get involved as much as they can!

[Register for RI Slack](#)

[SCS Computing Facilities](#)

[Trash and Recycling](#)

[Who to See for What](#)

### [Department Approach to Press and Media Relations](#)

To assure consistency in all communications and to maximize external visibility to target audiences the marketing and communication staff works together to coordinate key messages and activities involving publicity.

The director of media relations in the SCS Dean's Office, [Aaron Aupperlee](#), is the point-of-contact between news media and the School of Computer Science community, including faculty, students, administrators and staff. He can assist with strategic planning for publicity, interview preparation, and (depending on the specific project or issue) may assist in developing news stories or multi-media for the SCS website and social media channels.

### [Women@SCS](#)

Women@SCS' mission is to create, encourage, and support women's academic, social and professional opportunities in the computer sciences and to promote the breadth of the field and its diverse community. The Women@SCS Advisory Committee consists of undergraduate students, graduate students, and faculty within the School of Computer Science.

The Women@SCS Advisory Committee consists of undergraduate students, graduate students, and faculty within the School of Computer Science.

Members of the Committee have initiated many programs, such as the Big/Little Sister program for undergraduates, the Student-Faculty Lunch Series, and other social and academic events. Women@SCS also sponsors outreach projects, such as the Women@SCS Outreach Roadshow and TechNights, a free weekly series of workshops for middle school girls taught by our students. In general, the committee strives to promote a healthy and supportive community atmosphere for ALL. Making a difference and solving problems serve as the basic motivating purposes of the organization.

## 10 Doctoral Degree Completion and Certification

### 10.1 Standard Degree Requirements & Degree Certification

Carnegie Mellon graduate students are expected to complete their degree requirements within the standard length of time for their program of study as outlined in the relevant Graduate Student Handbook. Standard program lengths for graduate students vary significantly – ranging from two semesters for some full-time master’s programs to several or more years for doctoral programs. Upon completion of the graduate program degree requirements, the degree will be certified by the student’s academic program in the semester in which the student completes the requirements.

#### *Early Competition*

Graduate students who consider the completion of all degree requirements in less than the standard length of time for their program of study may consult with their degree-granting program or department to determine if early degree certification is allowed and under what circumstances.

#### *Extended or Longer-than-Standard Competition*

Longer-than-standard degree completion may occur due to academic interruptions in making progress toward the degree as defined by the academic program, interruptions of full-time study or progress towards the degree due to serious, documented medical issues, or other unusual or unforeseen circumstances.

Doctoral students who require an extended period to complete their degree requirements must consult with their academic program, and are subject to the CMU Policy on Doctoral Student Status (<https://www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html>), specifically the “Time to Degree” section.

### 10.2 Additional Guidance for Students

#### *Program of Study*

Students seeking guidance about their program of study and degree requirements should consult with their academic advisor and/or appropriate associate dean.

#### *Financial Aid and Student Account*

Students are expected to make normal progress toward their degree in order to graduate within the standard timeframe for their program of study. Under U.S. Federal Title IV regulations, student eligibility for federal financial aid is contingent upon enrollment in and successful completion of courses that are counted as credit toward their current degree program. To receive the maximum amount of federal financial aid for which they may be eligible, students must enroll each semester in at least 36 units that count toward their current degree level. (See separate guidance regarding integrated degree completion.)

Students should consult with their designated college liaison in The HUB regarding billing and financial aid, particularly for early completion, longer-than-standard completion, or integrated undergraduate and master's degree programs.

### *International Students*

Immigration status for students in F-1 and J-1 non-immigrant status is tied to making normal progress toward completing degree requirements. Therefore, F-1 and J-1 students who are considering completing their degree requirements early, anticipating longer-than-standard completion, or moving from an undergraduate to a graduate student classification (integrated undergraduate-graduate study) should consult with their designated advisor in the Office of International Education (OIE) to ensure compliance with immigration regulations.

## 10.3 Statute of Limitations

As outlined in the Doctoral Student Status Policy:

<https://www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html>

students will complete all requirements for the Ph.D. degree within a maximum of ten years from original matriculation as a doctoral student, or less if required by a more restrictive department or college policy. Once this time-to-degree limit has lapsed, the person may resume work towards a doctoral degree only if newly admitted to a currently offered doctoral degree program under criteria determined by that program.

Under extraordinary circumstances, such as leave of absence, military or public service, family or parental leave, or temporary disability, a school or college may, upon the relevant department's recommendation and with the written approval of the dean, defer the lapse of All But Dissertation status for a period commensurate with the duration of that interruption. Students, who are pursuing the Ph.D. degree as part-time students for all semesters of their program, as approved by their program, may also appeal to their program or department for extension of the time to degree limit.

## 10.4 Residency Requirements

The university requires PhD students to have a minimum of one year in residency on a CMU campus.

## 10.5 Registration Process/Procedures

It is the full responsibility of the student to register for courses. Each semester, students should consult with their advisor/s before registering for courses.

## 10.6 Department Policy on Registration

During the fall and spring semesters Ph.D. students should normally be registered for 48 units. During the summer, students should normally be registered for 36 units. It is the student's responsibility to register themselves each semester.

## 11 Doctoral Course of Study

### 11.1 Overview

This document defines the degree requirements for candidates in the Ph.D. Program in Robotics in the School of Computer Science at Carnegie Mellon University. The program is designed so that a well-prepared student can complete the doctoral degree in four to five years. The Ph.D. program requires completion of:

- Course Qualifiers (Core and Specialized)
- Research Qualifier
- Thesis

The Course and Research Qualifiers are performed concurrently and are designed to take approximately equal amounts of time during the student's first two years. The doctoral dissertation and its associated research will normally require two to three further years for completion.

The exact degree requirements for a student in the program are as defined in the Course of Study as of the date that student first enrolls in the Robotics Ph.D. Program. Any subsequent changes to the Course of Study may optionally be selected by the student, or the student may choose to retain the previous requirements.

Occasionally, it is appropriate for a student to deviate slightly from the requirements as defined in the Course of Study. A student may request approval for a specific proposed alternative from the Chair of the Robotics Ph.D. Program. Generally, the Robotics Program Committee will review the request and make a recommendation to the Chairperson.

### 11.2 Preparation

The Robotics Doctoral Program accepts strongly motivated and exceptionally talented students from a wide range of educational backgrounds. It is each student's personal responsibility to arrive with, or to acquire rapidly thereafter, basic understanding (at the level of an introductory undergraduate course) in the following areas:

- Mathematics: calculus, linear algebra, numerical analysis, probability and statistics
- Computer Science: programming, data structures, algorithms
- Physics and Engineering: mechanics, dynamics, electricity and magnetism, optics

On request, the faculty will advise incoming students about individually appropriate alternative ways to satisfy these requirements, such as taking an undergraduate course, serving as a teaching assistant in an undergraduate course, or self-study by guided reading and discussion.

## 11.3 Course Qualifiers

Each student must complete the two course qualifiers in:

- Core Courses, consisting of one course from each of four core areas
- Specialized Courses, comprising 48 units of coursework (typically four graduate courses) in a specialized area defined by the student

Courses must be passed with a grade of B-, or better, to fulfill, or contribute to, completion of a course qualifier.

All of the necessary study and evaluation within the Robotics Ph.D. Program are contained in the Course Qualifiers. There are no other examination requirements for the Doctoral degree in Robotics. Students are encouraged to attend additional courses if they and their advisor agree it would be valuable, but such courses are not required for the Robotics degree and may be substituted for required courses only if approved by the Chair of the Robotics Program. Seminars are valuable educational experiences, but do not count for credit toward a course qualifier.

Students in the Robotics Ph.D. Program must register with the university and enroll for credit for all courses taken as part of fulfilling the Course Qualifiers.

## 11.4 Core Course Qualifier

Students must pass four Core Courses, one course from each of the following four Core Areas:

- **Perception:** vision, image sensors, range data interpretation, tactile and force sensors, inertial guidance, and other sensors. Core courses in Perception are 16-720 Computer Vision or 16-722 Sensing and Sensors, or for students with computer vision experience, 16-820 Advanced Computer Vision, 16-822 Geometry-based Methods in Vision or 16-823 Physics-based Methods in Vision.
- **Cognition:** artificial intelligence for robotics, knowledge, representation, planning, task scheduling, and learning. Core courses in Cognition are 15-780 Artificial Intelligence, 10-701 Machine Learning (or 10-715 Advanced Machine Learning), and 16-831 Introduction to Robot Learning.
- **Action:** kinematics, dynamics, control, manipulation, and locomotion. Core courses in Action are 16-741 Mechanics of Manipulation, 16-711 Kinematics, Dynamic Systems, and Control, and 16-761 Mobile Robots
- **Math Foundations:** optimal estimation, differential geometry, computational geometry, and operations research. The one core course in this area is 16-811 Math Fundamentals for Robotics.

## 11.5 Specialized Course Qualifier

The Specialized Course qualifier is a sequence of courses chosen by the student to enhance the Core Course subject matter by adding greater depth in a particular area. These specialization courses must total at least 48 units of graduate coursework. In this way, the foundational science component of the program is complemented by studies that keep pace with new developments and current topics. The courses should have coherence in subject matter. They may be directly related to the student's thesis research but are not restricted to that topic.

The Specialized Course Qualifier must be defined by the student in conjunction with their Ph.D. Advisor and then approved by the Chair of the Ph.D. Program. Typically, the student will identify 4 graduate courses that relate to their interests and will complete and submit a Specialized Qualifier approval form. Students are strongly encouraged to seek approval before completing courses; any course completed prior to approval is at risk and may not be deemed eligible for their qualifier.

**The Specialized Qualifier courses must total at least 48 units**, usually four full-semester graduate courses. The following guidelines cover the usually applicable constraints and will help in composing a Specialized Qualifier sequence.

- Graduate level (600 - 800-level) courses only
- No more than 12 units of non-doctoral (600-level) graduate courses
- No more than 12 units of project-only courses
- No more than 12 units of independent study  
(Independent study courses must include syllabus, schedule, assignments, and evaluation criteria. Syllabus submitted with the SQ form.)
- Core courses can be used in the Specialized Qualifier sequence, but only in addition to 48-units of Core Qualifier courses
- Teaching Assistantships cannot be included as Specialized Qualifier courses

## 11.6 Waivers

At Carnegie Mellon courses can only be credited to a single degree; additionally transfer credit for graduate courses completed at other institutions is not granted in robotics.

Robotics graduate courses, completed at Carnegie Mellon, including those completed while in a masters program, will automatically be waived and associated units considered complete. If a student possesses all of the knowledge conferred and evaluated in a particular course, they may apply for a waiver to be released from the requirement of enrolling and completing

the course. The waiver process involves documentation of prior coursework and experience and thorough evaluation of material learned.

The Chair of the Ph.D. Program will then assign a suitable faculty member to evaluate the request, typically the relevant course instructor or an expert on the topic. The faculty member will then conduct an evaluation which may include oral examination, proctoring of course quizzes or exams including final exams, assigning course exercises, assignments or projects, or any combination of these. They will assess the extent and quality of knowledge and its sufficiency relative to the course objectives and requirements.

In some cases, the faculty may determine that a student has demonstrated significant knowledge of the research area, but not sufficient to waive the course requirement entirely. In such cases, the faculty may grant a conditional waiver, contingent upon additional work, such as successfully acting as teaching assistant in the course or completing some designated project. If a student disagrees with the outcome of the waiver application, they may petition the Robotics Program Committee to review the case.

Waiver applications must be submitted during the first year in the Ph.D. program.

## 11.7 Research Qualifier

The Research Qualifier examines the skills that are important for every researcher to possess including scholarly research, speaking, writing, and teaching. The Research Qualifier typically requires half of the student's time and effort for two years and is to be completed concurrently with the Course Qualifiers. The primary component of the Research Qualifier is supervised research under the guidance of a faculty member who serves as the student's advisor. In addition, the research qualification process includes serving as a teaching assistant, writing a research paper, and presenting a technical talk.

To oversee this process, the student forms a Research Qualifier Committee consisting of three faculty members and one Robotics Ph.D. student who has completed his or her second year of study. One faculty committee member must hold a primary appointment in Robotics. The faculty members should include the student's advisor(s) and one faculty member who is not participating in the student's research. Forms to verify completion of the parts of the Research Qualifier must be filled out by each member of the Research Qualifier Committee (with the exception of the Teaching requirement, which must be filled out by the instructor of the course for which the student serves as teaching assistant).

It is the student's responsibility to ensure that reviews are completed and submitted by the relevant deadline.

The Research Qualifier comprises four components:

- **Research Skills:** the ability to create, explore, refine, and test new ideas in robotics. Students are expected to demonstrate awareness of previous work in their area of

research, depth of insight into the problem, creativity in approaching the problem, and substance of results obtained. Students should meet and discuss their progress with every member of their Research Qualifier committee each semester until their skills component is complete.

- **Speaking:** the ability to communicate in oral presentation. Students are expected to demonstrate the ability to present technical material to a technical audience clearly and succinctly. The presentation must be made at a venue open to the public. Ideally, the Research Qualifying Committee will be in attendance, but committee members may designate proxies, subject to approval by the Program Chair, to evaluate the presentation.
- **Writing:** the ability to communicate in technical writing. A student is expected to produce a conference-length, or longer, paper, in which they are the sole, or the primary, author plus a one page executive summary in which they are the sole author. The paper should demonstrate a style, organization and clarity that enables researchers in the field to comprehend the problem, method, and results of the research. Students who have written papers prior to entering the Robotics Program may submit them for evaluation, provided they meet the above criteria.
- **Teaching:** the experience of teaching in a classroom environment. This includes demonstration of as many as possible of the following: lecturing, recitation instruction, homework and exam design, grading, office hours, curriculum design. Each student must serve as a teaching assistant in two (2) courses relevant to the Robotics Program. Allowable courses will be defined by the Chair of the Ph.D. Program. Students may arrange to serve as teaching assistant (TA) by contacting the Program Coordinator at the beginning of the semester before the semester in which the student will act as a TA. The student is expected to spend on average 10-15 hours per week or about one quarter of their time on teaching. The instructor should provide feedback to the student concerning the quality of the student's teaching. The instructor should report to the Program Coordinator his or her evaluation of whether the student has carried out the TA activities successfully.

Students may serve as co-instructors for one class, provided that they have already satisfied both TA requirements, have completed the Eberly Future Faculty Program, and have the support of their research advisor.

Note that the State of Pennsylvania requires proficiency in English to act as a teaching assistant. Non-native speakers must be evaluated at the Language Support in the Student Academic Success Center and either Pass or Restricted One on their ITA examination. It is the student's responsibility to achieve this proficiency in time to start (in their second year) to complete their required TA assignments (in their fourth year).

## 11.8 Master's Writing and Speaking

Students completing the Master of Science in Robotics (research masters) at Carnegie Mellon University who intend to matriculate into the Ph.D. program may waive the Writing and Speaking requirements for their Ph.D. upon successfully completing their Writing and Speaking requirements for their M.S.

Students must still form a Ph.D. Research Qualifier Committee and complete the Ph.D. Research Skills Qualifier and Teaching components.

## 11.9 Thesis

The doctoral thesis represents a novel and significant contribution to the state of art in robotics. Researching, writing and presenting a thesis is intended to occupy approximately two to three years of activity, with these specific parts:

1. Thesis Proposal
2. Dissertation
3. Oral Defense of the Thesis

The evaluation of all three of these components must be performed by the Robotics faculty, as represented by the student's Thesis Committee. The committee will consist of at least four members: a minimum of three from Carnegie Mellon, at least two of whom must be faculty members affiliated with the Robotics Institute (at least one faculty member with a primary appointment in Robotics) and at least one qualified researcher who is external to Carnegie Mellon. The student's advisor(s) chair the Thesis Committee. The entire composition of the committee must be approved by the Chair of the Ph.D. Program before the Thesis Proposal is scheduled.

Prior to presenting the Thesis Proposal, the four Core Courses of the Course Qualifier and the research, speaking and writing skills portions of the Research Qualifier must be complete. In the Thesis Proposal, the student is formally asking the faculty for permission to pursue a line of research leading to the Dissertation. To do this, the student must do the following:

- Describe a problem and its importance;
- Summarize and evaluate what previous work has been done by others to solve this problem;
- State what has been accomplished so far by the student and how and why it will lead to the solution, or partial solution, of the problem;
- Describe and state what the student intends to do to complete the dissertation and how long it is expected to take; and
- Identify what novel and significant contributions it will make to the field of Robotics that merit awarding the degree of Ph.D.

The oral presentation of the proposal is made publicly to the entire research community, including particularly the Thesis Committee. The Thesis Committee must then express approval to the Chair of the Program if the proposal is to be accepted.

The **Dissertation** itself is normally preceded by a year or more of research and writing after the proposal. The Dissertation is a scholarly document describing the problem, related work, the student's approach, the results and insights achieved, and the significance of the work. The written dissertation must be presented to the Thesis Committee for approval.

All Course and Research Qualifiers must be completed before scheduling a Thesis Defense. The faculty of the Robotics program and the local community must receive notice of all thesis presentations at least one week in advance. Therefore, students are required to provide the Program Coordinator with complete information, no less than ten days before the scheduled presentation, including: title, abstract, committee members, on-line location of thesis document and/or hard copy. The Program Coordinator will advertise these presentations on appropriate on-line and physical venues.

When the committee gives preliminary approval, the **Oral Defense** of the thesis can take place. At the Oral Defense, the committee and the entire community will have the opportunity to publicly question the work critically. Finally, the Thesis Committee on behalf of the faculty must decide whether to approve the oral defense and whether, or under what conditions, to accept the dissertation and recommend awarding of the doctoral degree.

A student will be certified for graduation and allowed to attend commencement ceremonies when the thesis is unanimously approved by his or her Thesis Committee and it has been delivered to the Program Coordinator in final form. The student will be awarded the degree of Doctor of Philosophy in the field of Robotics.

## 11.10 Robotics Orientation

The student's research education begins in the Robotics Orientation, which all Robotics students must attend at the beginning of their first semester in the program. The Robotics Orientation is a series of lectures, discussions, and demonstrations that familiarize the students with Carnegie Mellon and the Robotics Program, introduce the research projects and faculty within the Program and affiliated departments, and describe the computational and other resources available to students in the Program. The Robotics Orientation gives students an opportunity to learn what it means to conduct research and to get to know the faculty in the Robotics Program.

## 11.11 Advising and Matching Process

The candidate's advisor will be the faculty member who works most closely with that student. This is usually the most important factor in the student's research education, so choice of an advisor should be based on careful consideration. New candidates and faculty will have extensive opportunity to meet to discuss research, assess compatibility, and evaluate interests. The Matching Committee will match students and faculty advisors based on the

preferences of the students and the faculty, subject also to the research agenda (and funding) of the faculty.

In order to make this an informed process, the assignments are made approximately 6 weeks after the Robotics Orientation, giving an ample period of time for the new students to meet the faculty individually. Each new student should use this opportunity to talk to all the faculty whose research interests might overlap those of the student. In this way, the students can learn about all the available research areas of the faculty, and the faculty can meet and talk with the students, before commitments are made. Students and faculty present their preferences for advisor/advisee pairings, and these preferences are used in matching students and advisors. After the Matching process, each student begins guided research under supervision of the advisor.

The duties of the advisor include approving the student's selection of courses, mentoring the student in research, advising the student on methods and skills, providing research opportunities and facilities for the student, and reporting on the student's progress to the faculty.

Advising relationships are mutually agreed and are mutable. It is possible for a student to change advisors with approval of the Chair of the Ph.D. Program. A student may request to switch to a new advisor, to add an additional co-advisor, or to remove a co-advisor. In this way, the student's changing perspectives and research focus can be accommodated by the program. Generally, the student should discuss such matters first with their current advisor(s), then make a tentative agreement with the new advisor(s), then finally request that the new plan be approved by the Chair of the Ph.D. Program. The Chair of the Ph.D. Program is available to help guide the student through this process if needed.

### 11.12 Timeline of Study

It is expected that students will complete both the Course Qualifiers (Core and Specialized) in two years of dedicated study. Students who have completed at least half of the required courses in graduate study prior to entering the Program, such as in the Robotics Masters program, will be advanced one year in the timeline for completing the Course Qualifier. This means they are expected to complete remaining courses in only one year of dedicated study.

Concurrent with coursework, it is expected that students will complete the Research Qualifier, with the exception of one of two required teaching assignments, in two years of dedicated study. If necessary, the student may complete their second teaching assignment in their third year.

It is expected that the Thesis Proposal will require about half a year of productive research beyond the Research Qualifier for its preparation and that it will be presented during the student's third year in the Program.

Students who are more than one year beyond the expected completion time for a qualifier or proposal are not making satisfactory progress in the Program. Specifically if not complete with: the Course Qualifier after three years (or two years if advanced due to prior coursework) or the Research Qualifier after three years, final teaching assignment after four years, or the Thesis Proposal after four years, then students are not in good standing and, subject to the judgment of the faculty in the Review of Progress, may be removed from the Program.

### 11.13 Review of Progress

At the end of each semester, the entire faculty of the Robotics Program meets to discuss the record and progress of all students in the Program. The evaluation for each student is based on several factors:

- The student's status at the start of the semester, as expressed by the previous Doctoral Student Review evaluation;
- The student's accomplishments during the semester, as described by the student in a form submitted prior to the meeting, and summarized at the meeting by the student's advisor;
- The advisor's evaluation, expressed in the form of a draft of a Doctoral Student Review letter that the advisor proposes to be sent to the student;
- Input from other faculty who have had dealings with the student;
- Discussion by the faculty of all of the above factors at the Doctoral Student Review meeting, which may include modifications to the letter drafted by the advisor; and
- Final decision by the Chair of the Program based on the above discussion.

After the meeting, the Chair of the Program will send a letter of progress to each student, based on the recommendation of the faculty at the meeting. Through this mechanism, the faculty can report "satisfactory" or "unsatisfactory" progress, offer recommendations to the student and advisor, set specific progress goals that must be achieved, or, if necessary, terminate a student's participation in the program. The continuation or conditions of a student's funding may also be determined in the meeting, as described in the "Robotics Graduate Student Handbook".

In general, termination will be preceded by at least one unsatisfactory evaluation. An explicit warning (called an "N-1 letter") will normally be given one semester before any decision to terminate a student's participation in the program.

In addition to the progress review, the Doctoral Student Review meeting and resultant letters provide an opportunity for the faculty to learn about and acknowledge the students'

contributions in service to the Program and achievements such as research publications and awards. Matters of academic policy are frequently discussed at the Doctoral Student Review meeting as they arise in the discussion of individual students.

The Doctoral Student Review process ensures that each student's progress is reviewed by the entire faculty, and not only by the advisor. The Doctoral Student Review process involves a careful consideration by the faculty of each student's case. If the student wishes to appeal the decisions reflected in their letter, the student should state their perspective in a request to the Chair of the Program to review the case again. The Chair will undertake such a review, in consultation with the faculty as appropriate, and issue a written response to the student. If the student is not satisfied with the Chair's response, it may be appealed as described in the Student Handbook for Carnegie Mellon University.

### 11.14 Master's Degree in Robotics

The Robotics Doctoral Program at Carnegie Mellon is principally a Ph.D. program. However a student who is working towards a Ph.D. may receive the degree of M.S. in Robotics by completing the requirements as defined by the current Masters Program course of study. This M.S. degree may be completed as a terminal degree or may be granted while still continuing to the Ph.D. degree.

## A Core Courses

### A.1 Perception Core Courses

- **16-720: Computer Vision** (and **16-820 Advanced Computer Vision**) Topics covered include image formation and representation, camera geometry and calibration, multi-scale analysis, segmentation, contour and region analysis, energy-based techniques, reconstruction of based on stereo, shading and motion, 3-D surface representation and projection, and analysis and recognition of objects and scenes using statistical and model-based techniques.
- **16-722: Sensing and Sensor.** The principles and practices of quantitative perception (sensing) illustrated by the devices and algorithms (sensors) that implement them. Learn to critically examine the sensing requirements of proposed applications of robotics to real problems, to specify the required sensor characteristics, to analyze whether these specifications can be realized even in principle, to compare what can be realized in principle to what can actually be purchased, to understand the engineering factors that account for the discrepancies, and to design transducing, digitizing, and computing systems that come tolerably close to realizing the actual capabilities of available sensors.
- **16-822: Geometry-based Methods in Vision.** This course focuses on the geometric aspects of computer vision: the geometry of image formation and its use for 3D reconstruction and calibration. The objective of the course is to introduce the formal tools and results that are necessary for developing multi-view reconstruction algorithms. The fundamental tools introduced study affine and projective geometry, which are essential to the development of image formation models. Additional algebraic tools, such as exterior algebras are also introduced at the beginning of the course. These tools are then used to develop formal models of geometric image formation for a single view (camera model), two views (fundamental matrix), and three views (trifocal tensor); 3D reconstruction from multiple images; and auto-calibration.
- **16-823: Physics-based Methods in Vision (Appearance Modeling).** Everyday, we observe an extraordinary array of light and color phenomena around us, ranging from the dazzling effects of the atmosphere, the complex appearances of surfaces and materials, and underwater scenarios. For a long time, artists, scientists, and photographers have been fascinated by these effects, and have focused their attention on capturing and understanding these phenomena. In this course, we take a computational approach to modeling and analyzing these phenomena, which we collectively call "visual appearance". The first half of the course focuses on the physical fundamentals of visual appearance, while the second half of the course focuses on algorithms and applications in a variety of fields such as computer vision, graphics and remote sensing and technologies such as underwater and aerial imaging.

## A.2 Cognition Core Courses

- **15-780: Artificial Intelligence.** Introduction to Artificial Intelligence tailored toward the algorithms and applications of robotics, manufacturing, and engineering disciplines. Strong focus on modern numerical approaches to AI and robotics, including Bayes nets, classical decision-theoretical problems such as scheduling, and optimal and learning control of Markov systems. Motion planning and spatial reasoning, neural nets, qualitative reasoning, and fuzzy logic are covered in detail.
- **10-701: Machine Learning.** Machine Learning is concerned with computer programs that automatically improve their performance through experience. This course covers the theory and practice of machine learning from a variety of perspectives. Topics covered include learning decision trees, neural network learning, statistical learning methods, genetic algorithms, Bayesian learning methods, explanation-based learning, and reinforcement learning. The course covers theoretical concepts such as inductive bias, the PAC and Mistake-bound learning frameworks, minimum description length principle, and Occam's Razor. Programming assignments include hands-on experiments with various learning algorithms. Typical assignments include neural network learning for face recognition, and decision tree learning from databases of credit records.
- **10-715: Advanced Machine Learning.** The rapid improvement of sensory techniques and processor speed, and the availability in inexpensive massive digital storage, have led to a growing demand for systems that can automatically comprehend and mine massive and complex data from diverse sources. Machine Learning is becoming the primary mechanism by which information is extracted from Big Data, and a primary pillar that Artificial Intelligence is built upon. This course is designed for Ph.D. students whose primary field of study is machine learning. The topics of this course will in part parallel those covered in the general graduate machine learning course (10-701), but with a greater emphasis on depth in theory and algorithms. The course will also include additional advanced topics such as fairness in machine learning. Students entering the class are expected to have a pre-existing strong working knowledge of algorithms, linear algebra, probability, and statistics.
- **16-831: Introduction to Robot Learning.** This class addresses how robots can learn to make sequential decisions to operate in the world and generalize to diverse environments. The "robot learning" problem and it spans topics in machine learning, visual learning and reinforcement learning. In this course, we will learn the fundamentals of topics in machine/deep/visual/reinforcement-learning and how such approaches are applied to robot decision making. We will study fundamentals of: 1) machine (deep) learning with emphasis on approaches relevant for cognition, 2) reinforcement learning: model-based, model-free, on-policy (policy gradients), off-policy (q-learning), etc.; 2) imitation learning: behavior cloning, dagger, inverse RL

and offline RL; 3) visual learning geared towards cognition and decision making including topics like generative models and their use for robotics, learning from human videos, passive internet videos, language models; and 4) leveraging simulations, building differentiable simulations, and how to transfer policies from simulation to the real world; 5) we will also briefly touch topics in neuroscience and psychology that provide cognitive motivations for several techniques in decision making.

### A.3 Action Core Courses

- **16-711: Kinematics, Dynamic Systems, and Control.** Basic concepts and tools for the analysis, design, and control of robotic mechanisms. Topics covered include foundations of kinematics, kinematics of robotic mechanisms, review of basic systems theory, control of dynamical systems. Advanced topics will vary from year, including motion planning and collision avoidance, adaptive control, and hybrid control.
- **16-741: Mechanics of Manipulation.** Kinematics, statics, and dynamics of robotic manipulator's interaction with a task, focusing on intelligent use of kinematic constraint, gravity, and frictional forces. Automatic planning based on mechanics. Application examples drawn from manufacturing and other domains.
- **16-761: Mobile Robots.** This course teaches the fundamentals of autonomy for quadrotor aerial systems, which includes kinematics, dynamics, and control to enable agile flight. The course will cover time-parameterized trajectory generation to achieve a desired state at a given time; motion planning; and perception to enable higher-level autonomy tasks. Advanced topics will include exploration for both single- and multi-robot systems.

### A.4 Math Foundations Core Course

- **16-811: Mathematical Fundamentals for Robotics.** This course covers selected topics in applied mathematics. Topics covered in the past have included: polynomial interpolation and approximation; solution of nonlinear equations; roots of polynomials; approximation by orthogonal functions such as Fourier series; optimization; calculus of variations; probability; numerical solution of differential equations.

## B Research Qualifier

Some students may feel unprepared for the Research Qualifier. To help in that regard, there are courses and materials available that can prepare the student for speaking, writing, and teaching. For international students, the Language Support in the Student Academic Success Center can recommend remedial course work, workshops and

seminars on an individual basis to help ensure that students have the language skills to pass these three portions of the Research Qualifier.

### B.1 Research Skills

This is the most important skill learned as a Ph.D. student, and it is the primary responsibility of the advisor to mentor the student in research skills. Students and advisors should meet regularly to discuss research and plan approach. Additionally students should meet with every member of their Research Qualifier committee each semester.

### B.2 Speaking

A suitable course for a student to take to improve speaking ability is:

**90-718: Strategic Presentation Skills** (6 units)

In addition, research talks by internal and external speakers are frequently scheduled throughout the year. Students are encouraged to attend these to get an understanding of what is expected from a research talk.

### B.3 Writing

A suitable course for a student to take to improve writing skill is:

**76-870: Professional and Technical Writing** (12 units)

In addition, it is recommended that students read extensively in the field, especially award-winning papers, to get an idea of what good writing entails. The university Student Academic Success Center has many resources for improving writing and writing particular types of documents. A student's advisor can also provide opportunities to review papers for conferences and journals, another helpful tool in improving a student's writing skills.

### B.4 Teaching (Non-Native Speakers of English)

There are many courses and seminars offered weekly and each semester through the Eberly Center that can be taken to improve teaching ability.

For non-native speakers of English, Carnegie Mellon policy, in accordance with the Pennsylvania English Fluency in Higher Education Act, requires that all students apply for language certification through Language Support in the Student Academic Success Center before they can be certified to serve as International Teaching Assistants (ITAs). Students can satisfy the certification requirement using either the TOEFL option if their speaking score is between 26-30 or applying for the ITA test option. A rating of "Pass" or "Restricted One" must be attained in order to qualify for certification.

While Carnegie Mellon and Commonwealth of Pennsylvania policies require the above standard of students teaching assistants in undergraduate courses, the Robotics Institute requires these standards of all teaching assistants in any Robotics course, and all Robotics students assisting in a course in Robotics or any other department. This holds for both graduate and undergraduate courses. The Program Coordinator will monitor the status of all international students to ensure that a Pass or Restricted One has been attained before any student will be permitted as a teaching assistant. Students found to be out of status by assisting before they have attained a Pass or Restricted One will risk not having the teaching assistant assignment count toward his or her Research Qualifier and having to act as teaching assistant again once the required standards are met.

## 12 Doctoral Degree Requirements and Related Policies/Protocols

### 12.1 Required Units for Degree Attainment

Every student must complete 96 university units (typically 8 classes) worth of graduate courses. In addition, we have defined four breath core areas in robotics. To ensure that student acquire sufficient exposure to basic knowledge concepts, we require students take at least one class from each of the four core areas. Students can take the remaining courses, totaling 48 units, to gain more depth in their particular area of research.

### 12.2 Department Policy on Double Counting Courses

Any course counted toward another master's-level or bachelor-level degree may not be counted toward the Secondary Master's in Robotics in the Ph.D. program.

### 12.3 Department Policy/Process for Withdrawing from a Course

The department adheres to the University Policy on Course Withdrawal.

<https://www.cmu.edu/hub/registrar/course-changes/> "W" grades are not assigned to graduate students in CFA, DC and SCS.

### 12.4 Drop/Add/Withdraw Procedures

Students taking undergraduate and Masters level courses must follow the procedures and deadlines for adding, dropping, or withdrawing from courses as identified on the academic calendar. Information can be found at <https://www.cmu.edu/hub/registrar/course-changes/index.html> There is a separate calendar for doctoral level courses which can also be found at the above webpage.

### 12.5 Transfer Courses and Pittsburgh Council on Higher Education (PCHE)

Carnegie Mellon University offers students the opportunity to take courses for credit through a cross-registration program (see Pittsburgh Council on Higher Education (PCHE) and Cross-registration below) and through the receipt of transfer credit from other accredited institutions. The Carnegie Mellon University transcript will include information on such courses as follows: Carnegie Mellon courses and courses taken through the university's cross-registration program will have grades recorded on the transcript and be factored into the QPA. All other courses will be recorded on this transcript indicating where the course was taken, but without grades. Such courses will not be taken into account for academic actions, honors or QPA calculations.

<https://www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html>

### 12.6 Protocol for Evaluation of Transfer Credit

Transfer credit for graduate courses completed at other institutions is not granted.

## 12.7 Independent Study

Independent Study (16-995) is a course designed to provide students with an opportunity for intensive study of a subject that is either unavailable or insufficiently covered in regular course work. Independent study is not intended to substitute for existing courses, but to provide the opportunity for a specialized educational and research experience.

Any faculty member in the Robotics Institute is eligible to serve as the supervisor of an Independent Study research project. The student must provide a brief prospectus of the project to the faculty supervisor as a basis for reaching agreement on the objectives of the study and provide this to their advisor and to the Program Chair for approval.

## 12.8 Teaching Requirements

Graduate students are required to have a certain level of fluency in English before they can instruct in Pennsylvania, as required by the English Fluency in Higher Education Act of 1990. Through this Act, all institutions of higher education in the state are required to evaluate and certify the English fluency of all instructional personnel, including teaching assistants and interns. The full university policy can be reviewed at:

<https://www.cmu.edu/policies/faculty/evaluation-certification-english-fluency-instructors.html>

The fluency of all instructional personnel will be rated by Language Support in the Student Academic Success Center to determine at what level of responsibility the student can TA.

In addition to administering the International Teaching Assistant (ITA) Test (a mandatory screening test for any non-native speaker of English), Language Support in the Student Academic Success Center helps teaching assistants who are non-native English speakers develop fluency and cultural understanding to teach successfully at Carnegie Mellon. Visit the Student Academic Success Center website for additional information:

<https://www.cmu.edu/student-success/>

The Eberly Center for Teaching Excellence is a resource for TA and instructor training and included in the section Additional University Resources, Appendix A.

The responsibilities of a TA vary with different courses. Examples are:

- Help design homework assignments and other instructional materials
- Give recitations
- Grading
- Help with organizing poster sessions (if applicable)
- Advise small groups of students for class projects (if applicable)
- Hold office hours for individual tutoring

## 12.9 Research Requirements

### *Grading system for research*

Research is the fundamental part of the PhD program. PhD students will work on research with their faculty advisor. The advisor has the option to give a pass/fail grade for research courses. The default grade is a "P" pass which converts to "S" satisfactory on your transcript. The units with "S" grade are counted toward degree requirements but are not included in your GPA.

It is the responsibility of both the student and their advisor to formulate for each semester a set of reasonable goals, plans, and criteria for success in conducting directed research. Advisors are individually responsible for adequately supervising this portion of the graduate program.

Students should be working on directed research at least half time during the first two years. Once all coursework is completed, the directed research increases to full time (except when serving as a teaching assistant or taking additional courses).

Students should enroll for 24-48 units of Graduate Reading and Research (16-997) for each semester (Fall, Spring and Summer) in which they are active (excludes LOA and ABS status; and dual degree Portugal students). If students choose a Practicum (internship) for directed research, they must complete a form that is available from the Ph.D. Program Manager. To perform a Practicum more than 4 times, they must have prior approval from the Ph.D. Program Chair.

At each semi-annual Review of Progress meeting, the faculty assess the student's previous semester's research progress and the student's next semester's research plans to ensure that the student is making satisfactory progress. The evaluation of a student's progress in directed research often depends on the student having produced some tangible result; examples include the implementation of pieces of a software system, a theoretical advance, a conference paper or journal article, an annotated bibliography in a major area, or, as part of preparation for doing research, a passing grade in a graduate course (beyond the required 96 course units).

Advisors are individually responsible for adequately supervising this portion of the Ph.D. program.

### *Research funding options*

The program will provide tuition and academic fee coverage and stipend during the first year and will continue to provide financial support in future years, guaranteed for the academic year nine-monthly period, as long as the student continues to make satisfactory progress toward their degree.

GuSH Research Funding is a source of small research grant funds provided by the Graduate Student Assembly (GSA) and the Provost's Office and managed by the Office of Graduate and Postdoctoral Affairs. Students can find more information about the application process and deadlines at: <https://www.cmu.edu/graduate/professional-development/research-funding/index.html>

#### *Resources and Regulations Governing Research at Carnegie Mellon*

- Office of Sponsored Programs  
<https://www.cmu.edu/osp/>
- Office of Research Integrity & Compliance  
<https://www.cmu.edu/research-compliance/index.html>
- Intellectual Property Policy  
<https://www.cmu.edu/policies/administrative-and-governance/intellectual-property.html>
- Policy on Restricted Research  
<https://www.cmu.edu/policies/research/restricted-research.html>
- Human Subjects in Research Policy  
<https://www.cmu.edu/policies/research/human-subjects-in-research.html>

## 12.10 Changing Advisors

When advisors leave/quit, their student is expected to match with a new advisor as soon as possible and ideally no later than the following Doctoral Student Review Meeting. Student funding is maintained through N-1 semester (support not guaranteed past next term).

## 12.11 Internship Opportunities

The Robotics Institute recognizes that an external internship can be a valuable educational and research experience, especially if access to proprietary data is required for the student's research. We will allow PhD students to accept up to four external internships during their Ph.D. studies. Interning more than 4 times requires approval from the Ph.D. Program Chair.

International students are required to consult with Office of International Education for eligibility before seeking an internship/co-op or signing an offer contract (required addition to ensure the university is in compliance with immigration laws for F & J status students)

You must discuss your plans for an internship with your advisor for approval. The summer semester is the optimal time for an internship. Internships during the academic year are rare. The only way to complete an internship during the academic year is to take a Leave of Absence or to adhere to the department rules for Consulting.

## 12.12 Consulting and Outside Employment

Consulting is a privilege, not a right. We grant this privilege for one of two reasons:

The consulting task is relevant to the student's thesis work or a Carnegie Mellon research project.

The student has exceptional financial obligations.

Consulting is normally limited to a maximum of eight hours per week. The work performed must be directly related to your doctoral research.

A student who wishes to consult should obtain permission from their advisor and the Ph.D. Program Chair, and fill out the [External Appointment Request form](#).

We may require that students limit outside employment in order to be in compliance with University and government rules.

## 12.13 PhD Criteria for Advancement to Candidacy

University Policy for Doctoral Student Status

<https://www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html>

This a series of policies that set forth a definition of All But Dissertation (ABD), time limits on doctoral candidacy status, a definition of in residence and in absentia status for ABD candidates and the tuition and fees charged for candidates in each status. The ABD status agreement form, <https://www.cmu.edu/hub/docs/abd-status-agree.pdf> and ABD status change form, <https://www.cmu.edu/es/docs/abd-status-change.pdf>

## 12.14 Graduation and Certification of Degree

The Ph.D. Program Manager maintains a [checklist of procedures for scheduling the thesis oral presentation and completing the other requirements for graduation](#). The Ph.D. Program Manager certifies fulfillment of requirements for graduation only when the final version of the thesis

1. has been approved by the thesis committee, the Department Head, and the Dean, and
2. is submitted to the Ph.D. Program Manager at which time the student will be awarded the degree of Doctor of Philosophy in the field of Robotics.

Students are not permitted to participate in commencement exercises unless final certification has been made.

If the final copy of the thesis is not submitted within one year of the thesis defense, a second defense may be required before making a final certification.

## 12.15 Leave of Absence and Withdrawal

Students who wish to leave the program temporarily may request a leave of absence by submitting a request to the Ph.D. Program Manager. Leaves are initially granted for a period of no more than one year, but an extension of up to one additional year may be granted under exceptional circumstances. When an extension is granted, the conditions for return must be negotiated with the advisor and the Ph.D. Program Chair prior to returning to the program. Students not in good standing will have conditions for return determined by the Ph.D. Program Chair in consultation with the advisor.

Students on leave of absence should contact the Ph.D. Program Manager two months prior to the end of the leave to indicate their plans for the next year. While a leave can, in principle, start at any time, university regulations allow students to return only at the beginning of a semester (usually late August or early January).

University policy for Student Leaves:

<https://www.cmu.edu/policies/student-and-student-life/student-leave.html>

University process for Leave of Absence and Withdrawal:

<https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/>

University Student Health Insurance during a Leave of Absence or Withdrawal

<https://www.cmu.edu/health-services/leaving-cmu/index.html>

## 12.16 Withdrawal of Degree

The university reserves the right to withdraw a degree even though it has been granted should there be discovery that the work upon which it was based or the academic records in support of it had been falsified. In such a case, the degree will be withdrawn promptly upon discovery of the falsification. The complete reference to this university policy is available at: <https://www.cmu.edu/policies/student-and-student-life/withdrawal-of-a-degree.html>

## 13 Grading and Evaluation

### 13.1 University Policy on Grades

<https://www.cmu.edu/policies/student-and-student-life/grading.html>

This policy document details university grading principles for students taking courses and covers the specifics of assigning and changing grades, grading options, drop/withdrawals and course repeats. It also defines the undergraduate and graduate grading standards.

### 13.2 Grades & Grading

Passing grade for graduate courses is B- or better. Once the required coursework is completed, students register only for a blanket course (e.g., "Reading and Research") covering all their program activities for that semester, for which they receive a Pass/No Pass grade.

Robotics Ph.D. students may formally register for graduate or undergraduate courses in other departments, in which case they are subject to the grading policies of the University and the department offering the course.

Students enrolled in other programs, but taking courses in Robotics, are assigned either a letter grade or a "Pass/Fail/No Grade," at the option of the instructor. When a letter grade is required by the student's home department in order to receive credit toward the degree, the policy of the home department will be respected.

### 13.3 Course Audit Policy

Auditing is presence in the classroom without receiving academic credit, a pass/fail, or a letter grade. Audited courses will not count towards your degree requirements. The extent of a student's participation must be arranged and approved by the course instructor. A student wishing to audit a course is required to register for the course, complete the Course Audit Approval Form, obtain permission of the course instructor and their advisor, and return the form to the Registrar's Office prior to the 10th day of class.

Any student enrolled full-time may audit a course without additional tuition charges. Part-time students who choose to audit a course will be assessed tuition at the regular per-unit tuition rate.

### 13.4 Process for Appealing Final Grades

<https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>

Final grades will be changed only in exceptional circumstances and only with the approval of the instructor and the department, unit or program. Grading is a matter of sound discretion of the instructor and final grades are rarely changed without the consent of the instructor who assigned the grade. The following circumstances are the unusual exceptions that may warrant a grade appeal: (a) the final grade assigned for a course is based on manifest error (e.g. a clear error such as arithmetic error in computing a grade or failure to grade one of the

answers on an exam), or (b) the faculty or staff member who assigned the grade did so in violation of a University policy.

### 13.5 Policy on Grades for Transfer Courses

<https://www.cmu.edu/policies/student-and-student-life/transfer-credit-evaluation-and-assignment.html>

Carnegie Mellon University offers students the opportunity to take courses for credit through a cross-registration program (see Pittsburgh Council on Higher Education (PCHE) and Cross-registration below) and through the receipt of transfer credit from other accredited institutions. The Carnegie Mellon University transcript will include information on such courses as follows: Carnegie Mellon courses and courses taken through the university's cross-registration program will have grades recorded on the transcript and be factored into the QPA. All other courses will be recorded on this transcript indicating where the course was taken, but without grade. Such courses will not be taken into account for academic actions, honors or QPA calculations.

### 13.6 Academic Integrity

<https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>

The policy includes the University expectations around academic integrity and provides definitions of cheating, plagiarism, and unauthorized assistance.

Students at Carnegie Mellon are engaged in intellectual activity consistent with the highest standards of the academy. The relationship between students and instructors and their shared commitment to overarching standards of respect, honor and transparency determine the integrity of our community of scholars. The actions of our students, faculty and staff are a representation of our university community and of the professional and personal communities that we lead. Therefore, a deep and abiding commitment to academic integrity is fundamental to a Carnegie Mellon education. Honesty and good faith, clarity in the communication of core values, professional conduct of work, mutual trust and respect, and fairness and exemplary behavior represent the expectations for ethical behavior for all members of the Carnegie Mellon community.

### 13.7 Academic Integrity Department Policy

Academic integrity violations for Robotics Ph.D. students will result in a review of progress meeting independent of the semi-annual Doctoral Student Review. This could result in a change of status at that time. Academic integrity on research papers, including a dissertation, is also enforced strictly; citations are required to avoid plagiarism, including self-plagiarism.

Elevated levels of misconduct either within or outside of a class setting may, upon recommendation by the Director and confirmation by the Department Head, result in immediate Academic Probation, Suspension, or Dismissal. The Department Head's determination may be appealed (see "Appeals and Grievances"). Students will receive official notice of academic actions, such as the imposition or removal of probation, in the form of a letter mailed to the "permanent address" on file with the University.

## 14 Safeguarding Educational Equity

### 14.1 Assistance for Individuals with Disabilities

<http://www.cmu.edu/education-office/disability-resources/>

The Office of Disability Resources at Carnegie Mellon University has a continued mission to provide physical, digital, and programmatic access to ensure that students with disabilities have equal access to their educational experience. We work to ensure that qualified individuals receive reasonable accommodations as guaranteed by the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973. Students who would like to receive accommodations can begin the process through Disability Resources' secure online portal:

<https://rainier.accessiblelearning.com/cmu/> or email [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) to begin the interactive accommodation process.

Students with physical, sensory, cognitive, or emotional disabilities are encouraged to self-identify with the Office of Disability Resources and request needed accommodations. Any questions about the process can be directed to [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu), or call (412) 268-6121.

### 14.2 Sexual Misconduct Policy

The University prohibits sex-based discrimination, sexual harassment, sexual assault, dating/ domestic violence, sexual exploitation, stalking, and violation of protective measures. The University also prohibits retaliation against individuals who bring forward such concerns or allegations in good faith.

The University's Sexual Misconduct Policy is available at:

<https://www.cmu.edu/policies/administrative-and-governance/sexual-misconduct/index.html>

The University's Policy Against Retaliation is available at:

<https://www.cmu.edu/policies/administrative-and-governance/whistleblower.html>

If you have been impacted by any of these issues, you are encouraged to make contact with any of the following resources:

- Office for Institutional Equity and Title IX  
<http://www.cmu.edu/title-ix/>  
412-268-7125  
[institutionalequity@cmu.edu](mailto:institutionalequity@cmu.edu)
- University Police  
<https://www.cmu.edu/police/>  
412-268-2323

Additional resources and information can be found at:

<https://www.cmu.edu/title-ix/resources-and-information/index.html>

### 14.3 Gestational and Parental Accommodations

<https://www.cmu.edu/graduate/programs-services/maternity-accommodation-protocol.html>

Providing holistic student support is a top priority at Carnegie Mellon. The protocols on this page are designed to support the parental needs of students and their families.

**Students seeking any of the Parental Accommodations described below must register with the Office of the Dean of Students by contacting the office for an appointment by calling 412-268-2075.**

Students are encouraged to register with the Office of the Dean of Students ninety (90) days in advance of the anticipated arrival of the child as applicable in the individual circumstance. At the time of registering, students will have the opportunity to consult about resources, procedures, funding options and preparation for discussing academic accommodations with the student's academic department. Students should also consult with their academic advisors either before or in conjunction with registering with the Office of the Dean of Students.

#### *Accommodations for Gestational Parents*

The birth of a child is a significant life event that may require time away from academic pursuits for delivery and recovery from delivery of a newly born child. Students whose anticipated delivery date is during the course of a semester may need to take time away from their academic responsibilities. Carnegie Mellon students seeking time away are afforded two options as possible accommodation:

- **Short-Term Accommodation for Gestational Parents** – A short term absence from academic responsibilities up to a maximum of six (6) weeks. Short-Term Accommodation may be extended by two (2) weeks, for a total of eight (8) weeks, where a longer absence is medically necessary. Prior to the absence students must work with relevant university faculty and staff to adjust their course work, research, teaching and other academic responsibilities during the period of absence. This may include extensions of time to complete assignments, incomplete grades, and/or dropping courses, shifting research responsibilities and adjusting TA assignments. Students who take a Short-Term Accommodation will remain enrolled.
- **Formal Leave of Absence**– A formal leave of absence under the Student Leave Policy. Generally, the Student Leave Policy permits students to take a leave of absence for a full-semester, mini-semester, or for the time remaining in the semester during which the leave is taken. Students who take a Formal Leave of Absence (<https://www.cmu.edu/policies/student-and-student-life/student-leave.html>) drop all remaining courses for the semester and are unenrolled for the semester. International students must consult with the Office of International Education (<https://www.cmu.edu/oie/>) before considering this option due to visa implications.

### *Parental Accommodation for Doctoral Students*

The university offers a Parental Accommodation for qualifying doctoral student parents to include up to four (4) weeks of time away from academic responsibilities with continued stipend support. This accommodation can be utilized within six months of the birth or placement of a child through adoption, foster care or legal guardianship. Gestational parents may utilize both the Short-Term Accommodation for Gestational Parents and the parental accommodation.

Careful planning and consultation is necessary given the unique contexts and requirements of each student's situation. Students will remain fully enrolled and will receive assistance in navigating the necessary planning and consultation processes.

### *Financial Assistance for Student Parents*

Carnegie Mellon also offers the following options for financial assistance to students who become parents while enrolled:

**Interest Free Loan** – Any student who becomes a parent is eligible to apply for an interest-free parental loan (<https://www.cmu.edu/student-affairs/dean/loans/>) from the Office of the Dean of Students.

**Doctoral Stipend Continuation (Gestational Parents)** – Doctoral students who are the gestational parent and who receive an academic stipend funded by Carnegie Mellon are eligible to continue to receive stipend funding for up to six (6) weeks during a Short-Term Accommodation for Gestational Parents or during a Formal Leave of Absence. Continued academic stipend funding may be extended by two (2) weeks, for a total of eight (8) weeks, if an absence longer than six weeks is medically necessary.

**Doctoral Stipend Continuation (Non-gestational Parents)** – Doctoral students who receive an academic stipend funded by Carnegie Mellon and are becoming a parent by adoption, birth, or through guardianship are eligible to continue to receive stipend funding for up to four (4) weeks during a Short-Term Parental Accommodation.

## 14.4 Consensual Intimate Relationship Policy Regarding Undergraduate Students

<https://www.cmu.edu/policies/student-and-student-life/consensual-relationships.html>

This policy addresses the circumstances in which romantic, sexual or amorous relationships/interactions with undergraduate students, even if consensual, are inappropriate and prohibited. The purpose of this policy is to assure healthy professional relationships. This policy is not intended to discourage consensual intimate relationships unless there is a conflicting professional relationship in which one party has authority over the other as in the policy.

## 15 Additional Department and University Policies/Protocols

### 15.1 Verification of Enrollment

Enrollment Services is the only University office that can provide an official letter of enrollment, official transcript, and enrollment verification. Enrollment verification can be requested online through The HUB at:

<https://www.cmu.edu/hub/registrar/student-records/verifications/enrollment.html>

### 15.2 Change of Address

Students are strongly encouraged to keep their current local address up to date in SIO, available via the HUB website: <https://www.cmu.edu/hub/sio/address-update.html>. This supports a university initiative to have accurate living information for students' official program/department/college/university notice, the ability to facilitate wellness checks, ensure international students are in compliance with visa requirements, etc.

### 15.3 Computing Resources

In early October, after the matching process, students and advisors will work together to determine computing needs. New students arriving in August without a personal computer may contact the Ph.D. Program Manager to request a loaner laptop for use during the fall semester.

### 15.4 "Grandfather" Policy

When policies are changed it is because the department believes the new rules offer an improvement. However, students currently enrolled whose degree program is affected by a change in policy may choose to be governed by the older policy that was in place at the time of their matriculation. In case degree requirements are changed and certain courses are no longer offered, the department will try to find some compromise that allows those students to satisfy the original requirements.

### 15.5 Time Away from Academic Responsibilities

Graduate students should not assume that their time-off follows the academic calendar of courses. The expectation is that graduate students continue research during academic breaks and time away from campus is negotiated. University Holidays are student holidays as well and students need to consult with their advisor/s about coverage during University Holidays if they have challenges with taking time off during that time, i.e. if experiments are running that need to be monitored continuously. Arrangements can be made for students to take an equal number of days off at another time.

### 15.6 Office Assignment Process

The Ph.D. Program Manager assigns all first year Ph.D. students a desk in the Ph.D. office suite on the first floor of NSH. Located in room 1502, this suite features six offices - 1502 A thru G - situated around a common space where students can study, gather, or socialize. We

encourage first year students to use this space, as they will meet people from the entire first year Ph.D. cohort and form bonds and connections.

At the end of the spring semester, first year students are reassigned to offices throughout RI. The assignments are based on many factors including, but not limited to, where their advisor has office or lab space. Much thought and consideration go into the office assignments for rising second year students, and advisors are consulted throughout the process. Offices for rising second year students are usually assigned by early July, with the hope that everyone moves by mid-July so the Ph.D. suite can be prepped for the arrival of the new class of first year students.

Occasionally, we ask students to move at other times of the year to maximize seating efficiency and/or to accommodate for changes in where their advisor is located. We appreciate your patience and understanding if we ask you to move.

Jess Butterbaugh ([jessb@andrew.cmu.edu](mailto:jessb@andrew.cmu.edu)) is the RI space manager; please contact her with questions.

## 15.7 Offboarding or Office Move Checklist

- recycle all papers
- throw away or remove all personal items
- throw away or remove old food and beverage containers and other trash
- return SCS-owned equipment, and/or recycle electronics equipment and accessories
- empty any items stored in lockable cabinets or bookshelves

## 15.8 Request for Accommodations Process

The process for managing specific requests for office accommodation requires the individual to go through the Office of Disability Resources (ODR). Students with specific seating needs should complete the Online Student Application.

Don't worry if you are unsure how to answer some of the questions. Provide as much information as you feel comfortable with. You are welcome to let your advisor, your program manager, or the RI space manager know once you have completed the application so we can keep an eye out for communication from ODR which is necessary before we can proceed with a seating assignment.

## 16 Financial Support

### 16.1 Stipends and Funding Payment Schedule

The stipend is \$3,330/month for the 9 months August 16, 2023 to May 15, 2024.

Ph.D. students in the Robotics Institute are paid semi-monthly. December stipends are usually distributed a little earlier, due to the holiday season. Check with the Ph.D. Program Manager if you are unclear about the distribution of stipends.

Students who receive stipends that are paid for or administered by the university must sign up for direct deposit as University payroll is a paperless system.

The department provides a dependency allowance that is 10% of the Robotics monthly base stipend per eligible dependent provided that your spouse or qualifying domestic partner earns less than 15% of the stipend amount.

#### Summer Stipend

Summer stipend is guaranteed for first year students. After the first full year, summer stipend is available for most Ph.D. students, particularly for those working on their dissertation. Please note that all financial support is subject to continued satisfactory progress toward your degree.

We believe it is also good for Ph.D. students to gain experience in industry for one or two summers during their career here at Carnegie Mellon. Faculty and staff will provide help in finding suitable summer employment.

### 16.2 Fellowships

We encourage students to seek their own external funding since often the award is prestigious (e.g., NSF or Hertz) or the source provides an opportunity to make professional connections. The Robotics Institute supplements the stipends of students with an outside fellowship, subject to any specific restrictions by the sources of the funding.

Students who are interested in applying for external fellowships should see their advisor or check the on-line information provided by the Office of Scholarships and Fellowships website. The website is an excellent resource for locating an abundance of information regarding available funding for students.

If a student receives an external fellowship/scholarship, they must notify Rebecca Klaas, Manager, Finance & Special Projects.

### 16.3 Continuation of Funding

Renewal of your appointment as a Graduate Assistant is contingent upon satisfactory performance. In addition, you must remain in good academic standing and continue to make adequate progress toward your degree as determined by faculty. **Lost Funding**  
International Students must notify the Office of International Education (OIE) if they lose their funding.

Graduate students who find themselves in need of immediate funds for emergency situations should contact the Office of the Dean of Students:  
<https://www.cmu.edu/student-affairs/index.html> to inquire about an Emergency Student Loan.

### 16.4 Tuition

As long as the student is in good academic standing (with regard to grade average, progress in the program, and length of time in the program), full tuition remission as well as the activity, transportation and technology fees will be covered. For the academic year 2023-2024, this tuition remission is valued at \$49,204. Students are responsible for the costs of purchasing their own books and miscellaneous supplies.

### 16.5 Employment Eligibility Verification

If you are receiving a stipend, are a TA, or are planning to have a position with CMU then Employment Eligibility Verification is required. Form I-9 must be completed within 3 business days of beginning work for any type of compensation (stipend or employment). Additional details are highlighted below. To ensure compliance with federal law, Carnegie Mellon University maintains the **Employment Eligibility Verification (I-9) Policy [pdf]** covering the university's I-9 and E-Verify requirements:

- Every individual receiving a stipend from CMU or employed by CMU must comply with the I-9 Policy by completing the Form I-9 within three business days following the first day of stipend start date/employment.
- Individuals who expect to work on a federally funded project are further responsible for submitting an E-Verify Processing Request Form to the Office of Human Resources if required.
- For more information, please see CMU's [Guidance for Completing the Form I-9 and E-Verify Requirements at CMU \[pdf\]](#), or visit the Human Resources Service website to learn more about Form I-9 and E-Verify and to schedule an appointment to complete the Form I-9.
- Students who fail to complete the Form I-9 in a timely manner may have stipend payments suspended. If employed by the university, an individual who fails to timely

complete the Form I-9 may be subject to disciplinary action up to and including termination of employment.

## 16.6 Taxes

The deadline for local, state, and federal taxes is April 15. You can obtain tax forms in the mail, at the post office, or at the Carnegie Library. Questions about your tax status should be addressed to the IRSTeleTax at 412-261-1040, or the Pennsylvania Department of Revenue at 412-565-7540. Although subject to federal taxes, student stipends are generally not assessed local or state taxes. <https://www.cmu.edu/policies/student-and-student-life/tax-status-of-graduate-students-awards.html>

## 16.7 University Financial Aid

Graduate students will find the Graduate Financial Aid Guide, information about funding options and how to apply for financial aid and other helpful links.

## 16.8 Office of the Dean of Students Emergency Support Funding

Graduate students who find themselves in need of immediate funds for emergency situations should contact the Office of the Dean of Students:

<https://www.cmu.edu/student-affairs/index.html> to inquire about the types of emergency funding available to enrolled students.

## 16.9 Travel/Conference Funding

### Graduate Student Travel

Graduate students are permitted to present papers at refereed conferences, to attend meetings required by research sponsors, or to attend other functions as directed by the faculty when there is a justifiable business purpose. Full reimbursement can be made for expenses incurred in such travel.

It is generally expected that the student's advisor, or other faculty member overseeing the travel, will arrange for funding before granting approval for the travel. If that is impossible, your department may have funds available.

For travel to a conference, approval must be obtained before the paper is submitted to the conference; for other travel, approval must be obtained before the student can make a commitment to attend.

### University Conference Funding

Conference Funding is a funding application process provided by GSA and the Provost's Office for students, student work groups or groups to attend a conference, whether as a participant or as a presenter. The process is managed by the Graduate Education Office. Students can find more information about the application process and deadlines at: <https://www.cmu.edu/graduate/professional-development/index.html>

## 16.10 Health Insurance Requirement

All full-time students are required to have medical insurance. Please see the health insurance criteria page for more information about this requirement.

If you elect to enroll in Carnegie Mellon University's Student Health Insurance Plan (SHIP), the University will cover 100 percent of the premium cost for your individual coverage under SHIP. While you will have the opportunity to purchase partner, spouse or dependent coverage under the SHIP plan, the University's support will be limited to 100 percent of the individual coverage amount. Please note that if you wish to elect the required health insurance coverage under an alternate plan, you will not be eligible for the University support referenced here.

Qualifying doctoral students are defined as having full-time enrollment in a CMU doctoral program, are making progress toward their degree in line with program policy and are stipend-supported and not receiving full external support from another source.

## 16.11 Estimates of the Time Allocated to Each Component of the Ph.D. Program

The following table indicates estimates for an appropriate distribution of effort in the Ph.D. program. It is based on actual student performance over the past few years; it also corresponds to the faculty's judgment of realistic estimates of the time required by various components of the program.

These figures are meant to be suggestive, not prescriptive. We present them so that all faculty and students can develop a shared image of the expectations of the program.

Always, except during the Robotics Orientation and when writing the thesis proposal.

| COMPONENT            | INTENSITY | DURATION   | TOTAL TIME |
|----------------------|-----------|------------|------------|
| Robotics Orientation | full-time | one week   | one week   |
| Courses              | 1/2 time  | 1 sem each | 4 sem      |
| Teaching             | 1/4 time  | 2 sem      | 2 sem      |
| Skills               | variable  | variable   | variable   |
| Directed Research    | 1/2 time  | *          | 5-7 sem    |
| Thesis Proposal      | 1/2 time  | 2 sem      | 1 sem      |
| Thesis               | full-time | until done | 2-4 sem    |
| Good Works           | variable  | often      | --         |

## **17 Appendix A**

The following pages are meant to broadly include only some of the resources available to graduate students. It is not an exhaustive appendix of resources, and students are strongly encouraged to visit the various websites linked below for the most up-to-date information.

## 18 Key Resources for Graduate Student Support

### Office of Graduate and Postdoctoral Affairs

<https://www.cmu.edu/graduate>

[graded@cmu.edu](mailto:graded@cmu.edu)

The Office of Graduate and Postdoctoral Affairs provides university-wide support for all graduate students and academic programs, with a focus on supporting graduate student success at Carnegie Mellon. Examples of resources offered through the Office of Graduate and Postdoctoral Affairs include, but are not limited to:

- Website with university resources, contact information for CMU programs and services, possible financial assistance and potential funding opportunities, and various procedural and policy information
- Newsletter to all graduate students with information on activities, resources, and opportunities
- Professional development seminars and workshops, and various programming and events for the graduate student community

The Office of Graduate and Postdoctoral Affairs also works directly with the colleges and departments on issues related to graduate students and serve as a resource for developing policy and procedures. The Office of Graduate and Postdoctoral Affairs partners with many other offices and organizations, such as the Graduate Student Assembly, to support the holistic graduate student educational experience.

### 18.1 Office of the Dean of Students

<https://www.cmu.edu/student-affairs/dean/>

The Office of the Dean of Students provides central leadership of the metacurricular experience at Carnegie Mellon including the coordination of student support. Graduate students will find the enrollment information for Domestic Partner Registration and Parental Accommodations in the Office of the Dean of Students or on their website. This Office also manages the Student Emergency Support Funding process. There are currently three forms of support funding for enrolled students: emergency student loans, student parental loans, and the Tartan Emergency Support Fund. Inquiring students will be provided with additional information about the various types of funding during a consultation meeting with a member of the Dean of Students team. Tuition costs are not eligible for Student Emergency Support funding.

College Liaisons and the Student Support Resources team serve as additional resources for graduate students. College Liaisons are senior members of the Division of Student Affairs who work with departments and colleges addressing student concerns across a wide range

of issues. College Liaisons are identified on the Important Contacts list in Student Information Online (SIO). The Student Support Resources team offers an additional level of support for students who are navigating a wide range of life events. Student Support Resources staff members work in partnership with campus and community resources to provide coordination of care and support appropriate to each student's situation.

## 18.2 The Division of Student Affairs

The Division of Student Affairs includes (not an exhaustive list):

- Athletics, Physical Education and Recreation
- Career and Professional Development Center (CPDC)
- Center for Student Diversity and Inclusion
- Cohon University Center
- Counseling & Psychological Services (CaPS)
- Dining Services
- Office of Community Standards and Integrity (OCSI)
- Office of Student Leadership, Involvement, and Civic Engagement (SLICE)
- University Health Services (UHS)
- Wellness Initiatives

## 18.3 Center for Student Diversity & Inclusion

<https://www.cmu.edu/student-diversity/>

Diversity and inclusion have a singular place among the values of Carnegie Mellon University. The Center for Student Diversity & Inclusion actively cultivates a strong, diverse and inclusive community capable of living out these values and advancing research, creativity, learning and development that changes the world.

The Center offers resources to enhance an inclusive and transformative student experience in dimensions such as access, success, campus climate and intergroup dialogue. Additionally, the Center supports and connects historically underrepresented students and those who are first in their family to attend college in a setting where students' differences and talents are appreciated and reinforced, both at the graduate and undergraduate level. Initiatives coordinated by the Center include, but are not limited to:

- First generation/first in family to attend college programs
- LGBTQ+ Initiatives
- Race and ethnically focused programs, including Inter-University

Graduate Students of Color Series (SOC) and PhD SOC Network

- Women's empowerment programs, including Graduate Women's Gatherings (GWGs)

## 18.4 Assistance for Individuals with Disabilities

<https://www.cmu.edu/disability-resources/>

The Office of Disability Resources at Carnegie Mellon University has a continued mission to provide physical, digital, and programmatic access to ensure that students with disabilities have equal access to their educational experience. The Office works to ensure that qualified individuals receive reasonable accommodations as guaranteed by the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973. Students who would like to receive accommodations can begin the process through Disability Resources' secure online portal or email [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) to begin the interactive accommodation Process.

Students with physical, sensory, cognitive, or emotional disabilities are encouraged to self-identify with the Office of Disability Resources and request needed accommodations. Any questions about the process can be directed to [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu), or call (412) 268-6121.

## 18.5 Eberly Center for Teaching Excellence & Educational Innovation

<https://www.cmu.edu/teaching/>

The Eberly Center offers a wide variety of confidential, consultation services and professional development programs to support graduate students as teaching assistants or instructors of record during their time at Carnegie Mellon University and as future faculty members at other institutions. Regardless of one's current or future teaching context and duties, Eberly's goal is to disseminate evidence-based teaching strategies in ways that are accessible and actionable. Programs and services include campus-wide Graduate Student Instructor Orientation events and our Future Faculty Program, both of which are designed to help participants be effective and efficient in their teaching roles. The Eberly Center also assists departments in creating and conducting customized programs to meet the specific needs of their graduate student instructors. Specific information about Eberly Center support for graduate students is found at:

<https://www.cmu.edu/teaching/graduatestudentsupport/>

## 18.6 Graduate Student Assembly

<https://www.cmu.edu/stugov/gsa/>

The Graduate Student Assembly (GSA) is the branch of Carnegie Mellon Student Government that represents and advocates for the diverse interests of all graduate students at CMU. GSA is composed of representatives from the different graduate programs and departments who want to improve the graduate student experience at the different levels of the university. GSA is funded by the Student Activities Fee from all graduate students. GSA passes legislation,

allocates student activities funding, advocates for legislative action locally and in Washington D.C. on behalf of graduate student issues and needs, and otherwise acts on behalf of all graduate student interests. GSA's recent accomplishments are a testament to their making a difference, and steps to implementing the vision laid out by the strategic plan.

<https://www.cmu.edu/stugov/gsa/about-the-gsa/strategic-plan.html>

GSA offers an expanding suite of social programming on and off-campus to bring graduate students from different departments together and build a sense of community. GSA is the host of the Graduate Student Lounge on the 3rd floor of the Cohon University Center. GSA also maintains a website of graduate student resources on and off-campus. GSA continues to rely on student feedback to improve the graduate student experience at CMU. Feel free to contact them at [gsa@cmu.edu](mailto:gsa@cmu.edu) to get involved, stop by their office in the Cohon University Center Room 304 or become a representative for your department.

## 18.7 Office of International Education (OIE)

<https://www.cmu.edu/oie/>

Carnegie Mellon hosts international graduate and undergraduate students who come from more than 90 countries. The Office of International Education (OIE) is the liaison to the University for all non-immigrant students and scholars, as well the repository for study abroad opportunities. OIE provides many services including: advising on personal, immigration, study abroad, academic, and social and acculturation issues; presenting programs of interest such as international career workshops, tax workshops, and cross-cultural and immigration workshops; international education and statistics on international students in the United States; posting pertinent information to students through email and the OIE website and conducting orientation and pre-departure programs.

## 18.8 Veterans and Military Community

<https://www.cmu.edu/veterans/>

Military veterans are a vital part of the Carnegie Mellon University community. Graduate students can find information on applying for veteran education benefits, campus services, veteran's groups at CMU, and non-educational resources through the Veterans and Military Community website. There are also links and connections to veteran resource in the Pittsburgh community. The ROTC and Veteran Affairs Coordinator can be reached at [urovaedbenefits@andrew.cmu.edu](mailto:urovaedbenefits@andrew.cmu.edu) or 412-268-8747.

## 18.9 Carnegie Mellon Ethics Hotline

<https://www.cmu.edu/hr/resources/ethics-hotline.html>

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity, violations of university policy, or violations of law. Students, faculty and staff can anonymously file a report by calling 1-844-

587-0793 or visiting <https://cmu.ethicspoint.com/>. All submissions are reported to appropriate university personnel and handled discreetly.

**The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.**

### 18.10 Policy Against Retaliation

It is the policy of Carnegie Mellon University to protect from retaliation any individual who makes a good faith report of a suspected violation of any applicable law or regulation, university Policy or procedure, any contractual obligation of the university, and any report made pursuant to the Carnegie Mellon University Code of Business Ethics and Conduct. Additional details regarding the Policy Against Retaliation are available at:

<https://www.cmu.edu/policies/administrative-and-governance/whistleblower.html>

## 19 Key Offices for Academic & Research Support

### 19.1 Computing and Information Resources

<https://www.cmu.edu/computing/>

Computing Services maintains and supports computing resources for the campus community, including the campus wired and wireless networks, printing, computer labs, file storage, email and software catalog. As members of this community, we are all responsible for the security of these shared resources. Be sure to review the Safe Computing (<https://www.cmu.edu/computing/safe/>) section and the University Computing Policy (<https://www.cmu.edu/policies/information-technology/computing.html>)

Visit the Computing Services website (<https://www.cmu.edu/computing/>) to learn more.

For assistance the Computing Services Help Center is available at 412-268-4357 (HELP) or [ithelp@cmu.edu](mailto:ithelp@cmu.edu).

### 19.2 Student Academic Success Center

<https://www.cmu.edu/student-success/>

The Student Academic Success Center's (SASC) work to support success focuses on creating spaces for students to engage in their coursework and approach to learning through many group and individual program options. SASC supports student success by providing academic coaching, subject-specific tutoring, effective communication strategies, accommodations for students with disabilities, and language support for multilingual learners. SASC engages with faculty and staff to improve the coordination and professional development for academic advisors. Visit the SASC website for more information about services offered in areas such as communication and language support; language and cross-cultural support; and learning support.

### 19.3 University Libraries

<https://www.library.cmu.edu/>

The University Libraries offers a wide range of information, resources, and services supporting graduate students in coursework, research, teaching, and publishing. The library licenses and purchases books, journals, media, and other needed materials in various formats. Library liaisons, consultants, and information specialists provide in-depth and professional assistance and advice in all-things information, including:

- Locating and obtaining specific resources
- Providing specialized research support
- Advanced training in the use and management of data

Sign up for workshops and hands-on topic-specific sessions such as data visualization with Tableau, cleaning data with OpenRefine, and getting started with Zotero. Weekly drop-in hours for Digital Humanities and for Research Data Research Management are scheduled during the academic year. Start at the library home page to find the books, journals, and databases you need; to identify and reach out to the library liaison in your field; to sign up for scheduled workshops; and to connect with consultants in scholarly publishing, research data management, and digital humanities.

## 19.4 Research at CMU

<https://www.cmu.edu/research/>

The primary purpose of research at the university is the advancement of knowledge in all fields in which the university is active. Research is regarded as one of the university's major contributions to society and as an essential element in education, particularly at the graduate level and in faculty development. Research activities are governed by several university policies. Guidance and more general information are found by visiting the Research at Carnegie Mellon website.

## 19.5 Office of Research Integrity & Compliance

<https://www.cmu.edu/research-compliance/>

The Office of Research Integrity & Compliance (ORIC) is designed to support research at Carnegie Mellon University. The staff work with researchers to ensure research is conducted with integrity and in accordance with federal and Pennsylvania regulation. ORIC assists researchers with human subject research, conflicts of interest, responsible conduct of research, export controls, and institutional animal care & use. ORIC also provides consultation, advice, and review of allegations of research misconduct.

## 20 Key Offices for Health, Wellness & Safety

### 20.1 Counseling & Psychological Services

<https://www.cmu.edu/counseling/>

Counseling & Psychological Services (CaPS) affords the opportunity for students to talk privately about academic and personal concerns in a safe, confidential setting. An initial consultation at CaPS can help clarify the nature of the concern, provide immediate support, and explore further options if needed. These may include a referral for counseling within CaPS, to another resource at Carnegie Mellon, or to another resource within the larger Pittsburgh community. CaPS also provides workshops and group sessions on mental health related topics specifically for graduate students on campus. CaPS services are provided at no cost. Appointments can be made in person, or by telephone at 412-268-2922.

### 20.2 Health Services

<https://www.cmu.edu/HealthServices/>

University Health Services (UHS) is staffed by physicians, advanced practice clinicians and registered nurses who provide general medical care, allergy injections, first aid, gynecological care, and contraception as well as on-site pharmaceuticals. The CMU Student Insurance Plan covers most visit fees to see the physicians and advanced practice clinicians & nurse visits. Fees for prescription medications, laboratory tests, diagnostic procedures and referral to the emergency room or specialists are the student's responsibility and students should review the UHS website and their insurance plan for detailed information about the university health insurance requirement and fees.

UHS also has a registered dietician and health promotion specialists on staff to assist students in addressing nutrition, drug and alcohol and other healthy lifestyle issues. In addition to providing direct health care, UHS administers the Student Health Insurance Program. The Student Health Insurance plan offers a high level of coverage in a wide network of health care providers and hospitals. Appointments can be made by visiting UHS's website, walk-in, or by telephone, 412-268-2157.

### 20.3 Campus Wellness

<https://www.cmu.edu/wellness/>

At Carnegie Mellon, we believe our individual and collective well-being is rooted in healthy connections to each other and to campus resources. The university provides a wide variety of wellness, mindfulness and connectedness initiatives and resources designed to help students thrive inside and outside the classroom.

### 20.4 Religious and Spiritual Life Initiatives (RSLI)

<https://www.cmu.edu/wellbeing/resources/religious-spiritual/index.html>

Carnegie Mellon is committed to the holistic growth of our students, including creating opportunities for spiritual and religious practice and exploration. RSLI has relationships with local houses of worship from various traditions and many of these groups are members of CMU's Council of Religious Advisors. They also offer programs and initiatives that cross traditional religious boundaries in order to increase knowledge of and appreciation for the full diversity of the worldview traditions. RSLI staff are available to support students across the spectrum of religious and spiritual practice and would be more than happy to help you make a connection into a community of faith during your time at CMU.

## 20.5 University Police

<https://www.cmu.edu/police/>

412.268.2323

The University Police Department is located at 4551 Filmore Street. The department's services include police patrols and call response, criminal investigations, fixed officer and foot officer patrols, event security, and crime prevention and education programming as well as bicycle and laptop registration. Visit the department's website for additional information about the staff, emergency phone locations, crime prevention, lost and found, fingerprint services, and annual statistic reports. Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies. The report also contains statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. Graduate students can obtain a copy by contacting the University Police Department at x2323. The annual security and fire safety report is also available online at:

<https://www.cmu.edu/police/annualreports/>

## 20.6 Shuttle and Escort Services

<https://www.cmu.edu/parking/transport/>

Parking and Transportation coordinates the Shuttle Service and Escort Service provided for CMU students, faculty, and community. The Shuttle & Escort website has full information about these services, stops, routes, tracking and schedules.

## **21 The WORD**

<https://www.cmu.edu/student-affairs/theword/>

The WORD is Carnegie Mellon University's online student handbook and serves as the foundation for the department (and sometimes college) handbook. The WORD contains university-wide academic policy information and resources, community policies and resources, and describes the university level procedures used to review possible violations of these standards. It is designed to provide all students with the tools, guidance, and insights to help you achieve your full potential as a member of the Carnegie Mellon community. Graduate students are encouraged to bookmark this site and refer to it often. University policies can also be found in full text at: <https://www.cmu.edu/policies/>