

SAM Student Handbook

The science of materials combines elements of chemistry, physics and engineering, and requires a solid background in mathematics. The CMU Science of Advanced Materials (SAM) Ph.D. program is designed to create a correspondingly interdisciplinary environment that will train effective researchers without erecting artificial boundaries between disciplines. The formal coursework focuses on the scientific framework for studying materials and is organized around the themes of modeling, synthesis and characterization. These are the key methodologies employed in materials research and the SAM program emphasizes the synergy among them.

The SAM program offers a research intensive program of study, with core courses, electives, and directed research hours designed to offer a flexible plan of study for students entering with a master's degree already earned in a related field.

Because of the interdisciplinary nature of this program, it is incumbent on students to communicate clearly and frequently with faculty and the program coordinator to plan their course of study and meet the required benchmarks. This handbook provides information to guide students and advisors through this process.

Table of Contents

The Plan of Study	3
Expected Timeline to Graduation	4
Committee Guidelines.....	6
Comprehensive Exams.....	7
The Dissertation Proposal and Prospectus	8
Expectations for Graduation and the Dissertation Defense	9
Funding for Travel	11
Responsibilities of Graduate Students in SAM.....	12
Responsibilities of Faculty Advisors in SAM	13

Plan of Study

On admission to the program, each student meets with his/her dissertation advisor to map out a plan of study, complete a transfer of credits for relevant graduate coursework, and plan the research project. As part of the application process, the faculty member should complete the [SAM Academic Plan form](#) to identify all relevant courses to meet the graduation requirements for the program. This is the starting point for the student and advisor to complete a plan of study. Successful completion of the PhD requires a minimum of 60 credit hours of graduate work beyond the bachelor's degree.

- The core research credits (SAM 701) are designed to provide an introduction to the faculty advisor's specific area of research and methods.
- A seminar course (SAM 685) is offered once per year to provide a common experience for all students and attention to scientific communication in the field of materials science.
- Elective course work as recommended by the faculty advisor and dissertation committee will augment each student's training as needed. Students may transfer in master's level credits to fulfill this requirement.
- Research credits (SAM 796) compose the bulk of a student's credit hours in the program, keeping the focus on the dissertation research. In the final semesters of a student's work in the program, he/she registers for SAM 899 Dissertation.
- Coursework should be documented on the [Authorization of Degree – Doctoral](#) form and submitted to the Coordinator. The student's record in Degree Progress can be updated then by the advisor or by the coordinator, so all parties can keep track of student progress within the program.

Required coursework

Required Courses I (4 hours)

SAM 685 Seminar

Required Courses II (9 hours)

SAM 701 Research Experience

Elective Courses I (6-15 hours)

These credits may be transferred from master's level work with the permission of the advisor and program director. Keep in mind that only 10 credits at the 500 level can be counted toward the PhD course requirements.

Research (20-29)

SAM 796 Directed Research in SAM

Dissertation (12 hours)

#SAM 899 Dissertation

(#register for no more than 3 credits of SAM 899 until the Prospectus has been submitted to the College of Graduate Studies and approved by the Dean of the College of Graduate Studies)

= 60 credits minimum

Expected timeline to graduation

Year 1

- Submit [Entry Form](#) to Coordinator
- Complete [Responsible Conduct of Research training](#) online via the CITI website and send certification with itemized coursework to Coordinator
- Coursework (SAM 701 and SAM 685; electives as required by advisor/committee)
- Complete [Authorization of Degree-Doctoral](#) form with advisor and submit to Coordinator
- Complete [Graduate Transfer Credit Request](#) if you have graduate coursework at another institution that may count toward your course requirements.
- Directed Research credits (SAM 796)
- Form dissertation committee by end of Spring semester – complete and submit to Coordinator the [Dissertation Advisor & Committee](#) form
- Meet with committee
- Submit [Progress Report](#) to Coordinator before beginning of Year 2 Fall semester

Year 2

- Coursework (SAM 685; electives as required by advisor/committee)
- Directed Research credits (SAM 796)
- Draft proposal for dissertation research project
- Take exams as proctored by committee. The advisor will notify the Program Coordinator when the student has passed the exams, which prompts the completion and submission of the [Admission to Candidacy](#) form.
- Present proposal to program faculty and students and meet with committee
 - If approved, committee will sign the [Prospectus form](#) (may be done electronically)
- Submit Prospectus to Coordinator to forward for approval by Graduate Studies
 - Attach a two page, double spaced abstract of proposal to signed Prospectus to submit to Graduate Studies
- Submit Progress Report to Coordinator before beginning of Year 3 Fall semester

Year 3

- Coursework (SAM 685)
- Research – Directed Research credits (SAM 796)
- Dissertation (SAM 899), depending on research performance
- Review [Dissertation Guidelines](#) as posted by the College of Graduate Studies
- Meet with committee
- Submit Progress Report to Coordinator before beginning of Year 4 Fall semester

Year 4 or 5

- Coursework (SAM 685; SAM 899)
- Research – Directed Research credits
- When committee agrees student is ready to defend:
 - Organize a date and time for both a public presentation of the dissertation research and a private meeting with the committee for the formal defense
 - Apply for graduation
 - Submit written dissertation to committee members at least two weeks before date of defense

- Present your research in an open seminar and meet with your committee following this
 - If they approve your dissertation, they sign the [Dissertation Sign off](#) form
 - Submit paperwork to the College of Graduate Studies and the Program Coordinator
- For students who leave campus before defending, keep in mind you must be registered for at least 1 credit hour each Fall and Spring semester until you complete all degree requirements. SAM 619 Continuing Credit is the appropriate credit for this registration. Due to the new student registration fee for each semester you are registered, it is in your best interests to complete your degree while still on campus, or within a semester after you leave campus, to avoid the financial burden of the continuing fee and tuition costs.

Committee Guidelines

Dissertation Advisor: The advisor for each student is determined upon admission to the program. Advisors must be SAM faculty members with graduate faculty status. It is unlikely that a student will be able to change advisors once he/she has begun this program since the funding plan for each student is linked to the faculty member's own funding.

Dissertation Committee composition

Each SAM dissertation committee will be comprised of four members: the advisor of the student usually serves as chair and must be a member of the SAM faculty; two other SAM faculty members are required. A fourth member is required but does not need to be part of the SAM faculty. Some students may opt to have a person from the department in which he/she works primarily or from another institution or external agency. Once the committee membership is finalized, the student should report the committee names and affiliations to the Coordinator, through the annual progress report or directly.

In all cases, those serving on dissertation committees must have Graduate Faculty status, approved by the Dean of the College of Graduate Studies. This status is awarded for Full (4 year) or Associate (3 year) terms and must be updated as necessary to enable students to complete their degrees. CMU faculty are usually awarded full 4 year terms while qualified persons from other institutions or agencies are usually awarded Associate status. The graduate faculty application forms are available through the [College of Graduate Studies website](#).

The Dissertation Committee members may be changed at the discretion of the student in consultation with the advisor.

Rubrics for evaluation

Students progressing through the SAM program will be evaluated annually by their committees and will also be assessed at the dissertation proposal and dissertation defense stages. At these benchmarks, special rubrics are used by the committee to provide an overall assessment of the student performance. These rubrics are available from the coordinator, on the SAM Sharepoint site available to faculty, and on the website.

Annual meetings

Students must meet with their committee at least once a year. These meetings are intended to keep committee members up to date with the student's progress, assist with feedback on obstacles or challenges, provide professional advice, etc.

Comprehensive Exams

While the SAM program requires comprehensive exams, there is no set format for these exams, other than that they be administered by the dissertation committee during Year 1 or 2 of the student's progress through the program. Exams may be in written or oral format. Examples of exam formats include: short answer and essay exam on a series of journal articles provided by committee; writing a white paper on a topic assigned by committee member; presenting a literature review in written or oral format on a topic assigned by the committee; and giving a research presentation on topic assigned by committee.

When exams have been completed and approved by the committee, the student then progresses to Candidacy status.

- The advisor reports the exams results to the program coordinator
- The coordinator sends the [Admission to Candidacy](#) form to the student along with pertinent information required for completion.
- The student can then complete the form and forward the Admission to Candidacy form for signatures from the advisor and program director.
- The student returns the form to the coordinator, where it is submitted to the student's file with Graduate Student Services.

The Dissertation Proposal Presentation and Prospectus

The Dissertation Proposal

Before a student embarks on the dissertation project in earnest, he/she should first present the research plan to the dissertation committee for approval. The format of a written proposal is up to the committee to define for the student. Students may follow the proposal format for an NSF proposal or some alternate format as requested by the committee. Proposals should include at a minimum: the research question and its significance, the experimental approach and the expected results.

The dissertation proposal presentation is required as a public presentation to the SAM program faculty and students. The student should confirm a time and date with the committee, and should contact the Coordinator at least a week before the presentation to provide time, date, room number, and a title and abstract (contact the Coordinator earlier if the student wishes assistance in reserving a room). The Coordinator will prepare a flyer to send out to the program faculty and students. Committee members will be given rubrics related to student assessment before the presentation and should submit the completed rubrics to the Coordinator for record keeping.

Usually the committee will meet with the student following the presentation to further examine the student on the proposed research. If the committee approves the research plan, they will sign the [Prospectus](#) which will be submitted with an abstract of the project plan to the Coordinator for submission to the College of Graduate Studies.

The Written Prospectus

When the committee unanimously approves a dissertation proposal, they indicate this approval by signing the [Prospectus](#) sheet from the College of Graduate Studies. The student then attaches a two page double spaced abstract of the project to this form to submit to the Coordinator, who will ask the program director to sign the form and will forward this for approval by the Dean of Graduate Studies. The approval by the Dean is required to indicate institutional approval of the project and enables the student to then register for credits in SAM 899 Dissertation.

If the committee is not unanimous in its approval of the dissertation proposal, the student must meet with the advisor to develop a revised plan. This should be submitted to the committee for review within 3 months from the original presentation date.

Expectations for Graduation

- 1) **The Dissertation Defense:** SAM students must prepare a written dissertation under the guidance of their Advisor and Committee and in accordance with the [dissertation guidelines](#) set out by the College of Graduate Studies. The written dissertation must be submitted to all committee members for review at least two weeks before the defense.
 - a. **Pre-defense committee approval:** students must be in communication with their advisor and committee members in the final months of their work towards the degree. The advisor and committee will discuss the timeline to the defense date with the student, generally 3-6 months before scheduling. Review the [Guidelines for the Preparation of Dissertations](#) posted on the College of Graduate Studies website.
 - b. **Application for graduation:** You must alert the Graduate Student Services office that you intend to graduate several months before the actual graduation date. Be sure to apply for graduation in a timely way and note the [deadlines for applying for graduation](#). This prompts an audit of your file and identifies any missing paperwork, incomplete grades or other issues that could delay your graduation. You can [apply for graduation](#) online. Notify the Coordinator as well.
 - c. **Public presentation:** When the advisor and committee indicate a student is ready to defend, the student should determine a date and time that will be convenient for all committee members and then contact the Coordinator to reserve a room for the public defense and the same or another room for the private meeting with the committee. The student should also provide material for a flyer to announce this publically (title, abstract). For the public part of the oral defense, the student should present a summary of the research, usually about 40 minutes in length. The audience is given time then to ask questions.
 - d. **Private meeting with Committee:** After the public presentation is complete, the committee will meet privately with the student. The committee will ask questions about the research project and broader questions about the field of study to gauge the student's overall understanding and expertise.
 - e. **Signature page and submission:** After the private meeting, the student will leave the room and the committee will determine if the student has completed satisfactorily all requirements for the dissertation and for the program. If the committee approves the dissertation and defense, all committee members will sign the [Dissertation Completion form](#). Sometimes the committee is in agreement that the student has defended successfully but needs to revise the dissertation, so they will wait to sign the form until these revisions are complete and approved.
 - f. **Second chance:** If the committee is not in unanimous agreement about the quality of the dissertation, the committee members will present the student with a plan to address the identified weaknesses of the dissertation research. The student will have 6 months to implement the plan and revise the dissertation. When the student and advisor determine the student is ready to present again, the student will follow the same timeline of providing the dissertation to the committee and presenting a defense.

2) Publication and presentation expectations for graduates

The SAM program is predicated on the scientific review processes provided through presentations and publications.

- i. By the end of the second year, students should have presented their research at a national or international conference.
- ii. By the dissertation defense date, students should have at least one 1st author or co-author research manuscript published or accepted in a peer-reviewed journal.

Travel Funding for SAM Students

Several offices, including the SAM program, can provide travel funding for presenting research at conferences and scientific meetings. Generally students are encouraged to talk with their advisor first, as there may be additional funding available from the advisor through grants and discretionary funds. Students may apply for up to \$350 from the SAM program, up to \$350 from the College of Science and Engineering (CSE), and up to \$500 from the Office of Research and Graduate Studies (ORGS). Each has its own set of guidelines and requirements so read the applications carefully and pay attention to deadlines.

NOTE: If the trip is outside the United States, the student must complete the [International Travel Request](#) form before incurring any costs for the trip. Once this travel is approved, then the student may begin to pay conference fees, airline travel, etc.

The SAM program does not have a separate application but keeps a copy of the CSE or ORGS application for the files. Students applying to CSE do not have to apply before travel; however, the SAM program has a limited budget for travel funding, so it is in the best interests of the student to apply well before the conference date to ensure that funding is available. The [CSE Student Presentation Grant](#) application is available on the SAM website or from the Program Coordinator. The Program Coordinator can assist students with the [Employee Reimbursement Voucher](#) request after the student has traveled – remember to keep all receipts as original receipts are required by the Travel office.

The ORGS sets one deadline each semester for all [ORGS travel funding requests](#) during that semester. Applications are held for review after that deadline and funds are often split among many applicants so the full award of \$500 is not always available.

Note: Students must include the SAM affiliation in all publications and presentations in order to be eligible for SAM funding.

Responsibilities of Graduate Students in SAM

As a graduate student in the SAM program, you are making a professional commitment to complete an intensive course of study, engage in independent research and write a dissertation. Your research advisor expects dedicated and substantial effort, initiative, respect and a willingness to listen to constructive advice.

As a graduate student at CMU, you are expected to abide by the institutional rules, procedures and standards as documented in the Graduate Bulletin and required by the program. These include:

- Complete required courses and maintain at least a B (3.0) grade point average.
- Develop a timetable and course map. Update as needed to keep track of your progress through the program.
- Maintain the required number of registered credits for each semester you are on a Research or Teaching Assistantship, or 6 each for the Fall and Spring semesters and 1-2 credits for the Summer.
- Respond in a timely way to professional communications from the program and other offices on campus (e.g. Faculty Personnel Services, Graduate Student Services).
- Complete relevant paperwork in a timely way, especially when prompted by advisor or program director/coordinator.
- Complete safety trainings as required for your area.
- Identify your affiliation as a SAM student on presentations and publications.

To be successful as a graduate student and a developing researcher, these also are important:

- Participate in your field by attending relevant seminars, reading published research, traveling to conferences and submitting manuscripts for publication.
- Be in regular communication with your advisor.
- Be receptive to advice from your advisor and your committee.
- Be a thoughtful co-worker: keep your work space tidy; be mindful of your use of supplies and materials; show tolerance and respect for others.
- Ask questions when you need information. Ask for assistance when you need help.

Responsibilities of Faculty Advisors in SAM

Faculty advisors are mentoring graduate students as future members of their profession and are expected to provide an intellectually stimulating learning environment for their students. Faculty advisors are the primary point of contact for information, expectations and resources so it is crucial that advisors set clear objectives and communicate effectively.

Funding: To advocate for admission to the program for an applicant, the faculty advisor must have a solid funding plan in place and communicate this plan to the student. Changes to this plan should also be communicated to the student so the financial status from semester to semester does not create confusion and stress for the student. The faculty member can coach the student in applications for external funding for travel and/or research support as well.

Coursework and research plan: When the applicant is admitted, the advisor should begin to discuss coursework and the research plan with the student. The coursework should be mapped out within the first semester.

Regular communication: The advisor should establish regular meeting times and provide timely feedback on the student's work, particularly written work. The advisor should assist with the completion of the necessary forms to keep the student moving through the program and meeting the university requirements.

Clear expectations: Advisors should provide explicit information on their expectations for the student, including lab work, hours, interaction with or advising of other students, etc.

Presentation and Publication: Advisors should provide guidance to students on conference submissions and development of manuscripts. Advisors should direct students to sources of travel funding and provide feedback on presentations. Advisors should provide instruction on the drafting of research papers, the appropriate hierarchy of authorship, the appropriate journal for submission, etc.