

# Computer Science Graduate Student Handbook

Department of Computer Science and Electrical Engineering  
University of Maryland, Baltimore County

October 2023

<http://www.cs.umbc.edu/CSEE/>

Graduate Program Director: Dr. Cynthia Matuszek  
([CMSCGradDirector@cs.umbc.edu](mailto:CMSCGradDirector@cs.umbc.edu))

Graduate Program Coordinator: Mrs. Keara Fliggins  
([CMSCGradCoordinator@cs.umbc.edu](mailto:CMSCGradCoordinator@cs.umbc.edu))

UMBC is an R1 research university, located in the Baltimore/Washington area, which offers graduate students an exciting environment for advanced study. With nearly 15,000 undergraduate and graduate students in the liberal arts, sciences, engineering, and public policy, UMBC is large enough to provide students with excellent training and research experience, and small enough for close interaction between students and faculty. The University is a growing center for research and development and technology commercialization. Adjacent to the campus, the UMBC Technology Center houses a number of research, development, and training organizations seeking interaction with our faculty and students.

In the CSEE Department, graduate programs are strongly supported by companies in the greater Baltimore-Washington area, and various collaborative arrangements with governmental and private institutions make state-of-the-art research facilities in the area available to UMBC faculty and students. The Department offers M.S. (with thesis or non-thesis option) and Ph.D. degrees in computer science (CMSC), in electrical engineering (EENG), and in computer engineering (CMPE). The department also offers the Master of Professional Studies (M.P.S.) degrees in Data Science and Cybersecurity. Separate admissions committees handle admission to each program. More information on these programs is available on their respective web sites.

**Prospective Students:** We hope you found the information useful, and we look forward to hearing from you (the contact information is listed on the CSEE graduate program website). Questions about the application process, the status of your application, and related matters should be directed to Graduate Program Coordinator Mrs. Keara Fliggins ([CMSCGradCoordinator@cs.umbc.edu](mailto:CMSCGradCoordinator@cs.umbc.edu)).

**Admitted Students:** Please read this document carefully, lengthy as it is! It will make you more aware of the program's requirements and the various milestones and forms. You will be assigned a "temporary" advisor once you inform us that you plan to attend UMBC, and that person will be able to answer questions that you have about our programs. We wish you success in your graduate studies at UMBC!

## Contents

### 1 Program Admission

3

1.1	Application Deadlines . . . . .	4
1.2	GRE Requirements and Waiver Requests . . . . .	5
1.3	Prerequisites for Admission . . . . .	6
<b>2</b>	<b>Financial Assistance</b>	<b>7</b>
2.1	Departmental Financial Aid for Continuing Students . . . . .	8
2.2	TA Responsibilities . . . . .	9
<b>3</b>	<b>Requirements for the M.S. Degree in Computer Science</b>	<b>10</b>
3.1	M.S. Program Guidelines . . . . .	10
3.2	TA Support and M.S. Thesis . . . . .	11
3.3	M.S. Timeline/Milestones . . . . .	11
<b>4</b>	<b>Requirements for the Ph.D. Degree in Computer Science</b>	<b>12</b>
4.1	Coursework Requirements . . . . .	12
4.2	Comprehensive Portfolio . . . . .	13
4.2.1	Course Performance . . . . .	14
4.2.2	Written Report . . . . .	14
4.2.3	Submission Details . . . . .	14
4.3	Preliminary Examination (Prelim) and Candidacy . . . . .	15
4.4	Dissertation Research . . . . .	15
4.5	Ph.D. Timeline/Milestones . . . . .	16
<b>5</b>	<b>What I Wish I Had Known: Advice from Fellow Students</b>	<b>17</b>
5.1	Forms and Deadlines . . . . .	17
5.2	Research and Lab Rotations . . . . .	17
5.3	Socializing . . . . .	18
5.4	Fellowships and Internships . . . . .	19
5.5	Progress Checklists . . . . .	19
5.6	Academic Integrity . . . . .	19
<b>6</b>	<b>Facilities and Special Resources</b>	<b>19</b>

## Overview

The CSEE department offers graduate programs leading to the M.S. and Ph.D. degrees in computer science. This program provides advanced instruction, training, and research opportunities that prepare students for careers and that foster marketable skills in industry, academia, and government.

The Student Learning Outcomes for the programs adopted by the faculty some years ago include:

1. Knowledge of the fundamental design and development principles of computer systems, the theoretical foundations of computer science, and an additional ‘breadth’ area of computer science.
2. Knowledge of one or more additional topic areas of computer science.
3. Ability to critically analyze prior research in their area.
4. In-depth knowledge of their chosen research area.
5. Ability to perform independent original research, including the ability to formulate research questions pertinent to their area, and the ability to answer them via theoretical analysis or experimentally via system design and/or development.
6. Ability to effectively communicate and defend their research findings to scientific peers in both written and oral formats.
7. The Ph.D. program has an additional outcome: Ability to conduct original research that substantively contributes to the knowledge in their research area.

The program reflects state-of-the-art knowledge in major theoretical and applied aspects of computation.

## 1 Program Admission

**General Policy:** When seeking admission to the graduate program, applicants must satisfy the entrance requirements of the Graduate School at UMBC. Applications are not processed until all documents and fees are received. Applicants must submit transcripts, three letters of recommendation, statement of purpose, Graduate Record Examination (GRE General Test) scores, and, for international students, scores from the TOEFL, IELTS, or Duolingo exams. Unofficial copies of documents may be submitted with the application, but official documents will be required if admission is granted. The GRE may be waived under certain circumstances, described below. Students may apply online at: [www.umbc.edu/gradschool/procedures/forms.html](http://www.umbc.edu/gradschool/procedures/forms.html)

Students may apply for admission to either the M.S. or the Ph.D. program. Admission to the Ph.D. program is highly selective and only students with excellent credentials will be accepted. Students who plan to pursue the Ph.D. degree, but who either do not have extensive research experience during their undergraduate studies (or at work) or do not already have an M.S. in computer science, are advised to apply for admission to the M.S. program.

Admission and financial assistance decisions are based on several factors, including undergraduate and graduate (if applicable) academic performance, GRE and TOEFL scores, recommendation letters, the statement of purpose, prior research experience and publication history. In particular, candidates applying to the

Ph.D. program should already have research experience, and submit a credible statement of purpose clearly describing their research interests and future career goals.

Newly admitted students will be assigned an academic advisor who can provide advice on choice of courses, degree requirements, and other important matters during the first year. By the end of the first year, students should have selected a faculty member who has agreed to serve as the research advisor for the M.S. or Ph.D. research.

## 1.1 Application Deadlines

The various application deadlines are shown in the table below. International applications are due at an earlier date, to allow time for processing of travel documents. Favorable consideration will be given to applications received early in each review cycle. It is the policy of the department to admit students based solely on their academic and research performance.

While we do accept applicants for either Fall or Spring admission, international applicants considering Spring admission should be aware of four potential difficulties:

1. Financial aid opportunities for Spring students are extremely limited, compared to Fall students. In practice, it is likely that Spring admits will not be considered for financial aid until the beginning of the following Fall.
2. Seats in popular classes are harder to get in the Spring than in the Fall, since so many students are beginning their fourth semester of study.
3. For those coming to UMBC on an F-1 student visa, the option of Curricular Practical Training (CPT) is not available until the student has finished two semesters of study. Students admitted in the Spring therefore cannot use CPT that following summer and lose the option of taking a summer job or internship. We offer few if any graduate courses in the summer, so Spring students are at a disadvantage in terms of using their summer break in a productive manner.
4. Housing in the campus area is in limited supply, and leases tend to coincide with the academic year. As a result, students who wish to take up residence near campus in the middle of the year may have little to choose from.

For these reasons, **we *strongly* advise international students to choose Fall admission.**

The UMBC Graduate School uses a single web portal for applications and fees, and programs vary in the deadlines they set. Furthermore, different deadlines apply to domestic and international students. **It remains the applicant's responsibility to submit their materials on time.** The application portal may accept your application and fee payment, but this does not imply any change in our program's deadlines, and late submission is grounds for deferral or rejection.

### APPLICATION DEADLINES

*Domestic applicants (U.S. citizens and permanent residents) not seeking financial support:*

Fall semester - June 1

Spring semester - November 1

*Domestic students seeking departmental financial support; and all international students:*

Fall semester - January 7

Spring semester - June 1 of the prior calendar year

## 1.2 GRE Requirements and Waiver Requests

The Graduate Record Examinations (GREs) provide the department with standardized data for comparing applicants from many parts of the world with different educational backgrounds. GRE scores are therefore required for most applicants. In some situations, the GRE is not needed in order for the department to make an admissions decision, and a GRE waiver may be granted. These are the qualifications for *requesting* a GRE waiver:

1. you are an M.S. or a Ph.D. applicant and you have, or are about to receive, a BS degree with a cumulative GPA of 3.5 or higher from an accredited US institution; or
2. Effective Fall 2022 and beyond, GRE scores are required for students requesting departmental financial assistance.

You must submit a GRE Waiver Request by the date on which the application is due. Qualifying for a GRE Waiver Request does not imply *approval* of the request. Your request will be granted if the Computer Science Graduate Admissions Committee agrees that GRE scores are not needed to make an admission decision in your case. UMBC students in the accelerated Computer Science BS/MS program do not need to take the GREs. These students should indicate that they are in the BS/MS program in their application. They do not need to submit a GRE Waiver Request.

How to submit a GRE Waiver Request:

The GRE Waiver Request form is available on the CSEE website:

[http://www.csee.umbc.edu/wp-content/uploads/2011/01/CS\\_GRE\\_Waiver\\_Request.pdf](http://www.csee.umbc.edu/wp-content/uploads/2011/01/CS_GRE_Waiver_Request.pdf)

Submit the completed GRE Waiver Request form with your resume and a transcript from the US institution of your BS or MS degree to the Graduate Program Coordinator ([CMSCGradCoordinator@cs.umbc.edu](mailto:CMSCGradCoordinator@cs.umbc.edu)).

If your resume and transcript have already been submitted to the UMBC Graduate School for your application, please indicate this on the request form. Unofficial transcripts are acceptable for the GRE Waiver Request. You will be notified by email regarding the decision made in response to your request.

In regard to application deadlines, the application process, and GREs, applicants often ask:

- *Are these application deadlines firm?*

Yes. Applications received after the deadline are subject to deferral to a later semester. Our university's application portal will still accept applications and fees after the deadlines, but the program reserves the right to recommend deferral, or deny the application, if received after these deadlines.

- *The application fee is more than I can afford! Can it be waived?*

The UMBC Graduate School collects the application fees, and requests to waive the fee should be directed there. Waiver codes should be requested well in advance of the application deadlines. Such requests must be justified, and are granted only rarely. UMBC observes the holiday break between December 24 and January 1, and email sent during that period will not be processed until after January 1.

- *Are unofficial copies of scores and transcripts acceptable?*

Yes, but if we offer admission, we will require official documents.

- *Do GRE Scores Expire?*

Yes. We can accept GRE scores only if they are not more than five years old.

- *Are letters of recommendation written only by professors?*  
No, we can accept letters from any person qualified to attest to your ability.
- *Are recipients of three-year degrees eligible to apply?*  
Yes. We look at total credits, and whether the prerequisite courses are satisfied, rather than the length of time in your degree program.
- *What English tests are accepted, and what are the minimum scores?*  
UMBC accepts TOEFL, both iBT and Essentials. We also accept the IELTS and the Duolingo. Minimum scores are set by the Graduate School and can be found on their web site. The minimum scores at this time are: TOEFL iBT: 80, TOEFL Essentials: 8.5; IELTS: 6.5; and Duolingo: 105.
- *What is the minimum GRE score needed for admission?*  
We have no set lower bounds. But most successful applicants score in the 70th percentile or higher on the quantitative exam, and in the 50th percentile or higher on either the verbal or analytical writing exams.
- *What if the GRE exam is not available to me until after the admission deadline?* Go ahead and send in your materials, and arrange for the GRE scores to be sent to us once you have taken the exam.
- *Can I apply for admission to UMBC in another program, and then transfer into Computer Science?*  
This is strongly discouraged. Students should apply for the program they want. The graduate school requires students to complete at least one semester of study before a request to change to another program will even be considered.

### 1.3 Prerequisites for Admission

Applicants to the graduate program in computer science are expected to have a strong background in computer science and mathematics. Specifically, applicants are expected to have taken the equivalent of the following UMBC courses:

- CMSC 203 Discrete Structures
- CMSC 313 Computer Organization and Assembly Language
- CMSC 331 Principles of Programming Languages
- CMSC 341 Data Structures
- CMSC 411 Computer Architecture
- CMSC 421 Principles of Operating Systems
- CMSC 441 Algorithm Design and Analysis
- MATH 151 Calculus I
- MATH 152 Calculus II
- MATH 221 Introduction to Linear Algebra
- At least one more advanced course in mathematics (e.g. STAT 355)

Students who lack one or two of the courses listed above are welcome to apply, with the understanding that they may be advised to take those courses if and when they're admitted. Students who lack the computer science background we expect may wish to enroll at UMBC or some other university as a non-degree student, which will permit them to take the courses they need before applying for admission to our graduate programs. At this time, non-degree status is available to international students only on an exceptional basis, as described on the UMBC Graduate School web site.

Students who are enrolled in some other graduate program at UMBC are expected to meet these same requirements for admission, and compete for financial aid on the same basis as other applicants.

Prospective applicants who are employed in local industry (public or private sector) are welcome to apply. We offer many of our courses in the late afternoon or evening hours. However, some courses required for the M.S. or Ph.D. degrees tend to be offered in the daytime hours. Students are encouraged to work with their employers to gain the flexibility to take these courses when offered, to avoid delay in fulfilling these requirements. Students employed in local industry are welcome to consider thesis (CMSC 799) or writing project (CMSC 698) topics that dovetail with their work.

## 2 Financial Assistance

Financial aid is available on a competitive basis to a limited number of qualified graduate students in the form of graduate teaching assistantships (TAs) and graduate research assistantships (RAs). Preference for TAs is given to first-year Ph.D. applicants. TA and grader positions in the computer science program are restricted to graduate students in computer science. US citizens may apply for financial aid through the SFS or CySP programs. For an overview of financial aid options for graduate students in general, see <https://financialaid.umbc.edu/graduate/>.

Prospective students should be aware that their applications are used for decisions regarding both admission and financial aid, but these are separate decisions. We understand that many students will be unable to attend unless some aid is offered, but at any given time we have many more deserving students than available TA positions. For the Fall admission cycle, TA offers are usually made within a month of admission offers.

Students who are offered admission without financial support are welcome to enter our M.S. program, but opportunities for newly-arrived students in this category are limited. We therefore recommend that MS students plan to support themselves during at least their first year of study.

Graduate RAs are often available to students actively engaged in M.S. thesis or Ph.D. dissertation research and are awarded and renewed subject to availability of funds and satisfactory research progress. RA positions are normally not available to incoming M.S. students.

Students are encouraged to apply directly to nationally awarded fellowship programs.

Students who have been supported on departmental TA-ships for three or more semesters and who seek the M.S. degree are required to take the thesis option (except for Ph.D. students who have passed the portfolio within the specified time limits).

Financial assistance decisions are based on several factors including academic performance, GRE and TOEFL scores, recommendation letters, statements of purpose, research experience and publication history.

The following is the recommended priority order in awarding teaching assistantships to incoming students:

1. Priority will be given to students with excellent academic credentials from reputable universities, a strong publication record, high GRE scores, strong support letters, who have already earned an M.S. degree in computer science and demonstrate a genuine wish to pursue the Ph.D. degree.

2. Students with excellent academic credentials from reputable universities, high GRE scores, strong support letters, a B.S degree in computer science and a desire to pursue either the M.S. or Ph.D. degree. If a student with a B.S. degree expresses interest in the Ph.D. program, the application has to be backed up by strong research participation as an undergraduate (with publications desirable).
3. Students who have any CMSC or other prerequisite courses unfulfilled will generally not be admitted with TA support.

We welcome applications submitted via a third party, such as Educo ([www.educosoft.com](http://www.educosoft.com)). However, such applicants are not, in general, eligible for financial aid from the department until at least their second semester of study.

## 2.1 Departmental Financial Aid for Continuing Students

Continued departmental support as a TA depends upon several factors. The minimum prerequisites to be eligible for TA support are: strong academic performance, strong TA performance if the student had been a TA/grader, meeting the required milestones, and a strong letter of support from the research advisor. There is also an upper limit on the number of semesters a student may be supported by the department (see Notes below).

Students who hold TA or RA positions are welcome to hold outside jobs through Curricular Practical Training (CPT) as long as the employment does not interfere with their studies or their TA/RA duties.

The student's advisor must sign off on the CPT paperwork before it will be approved by the department.

The following is the priority order for continuing students:

1. Ph.D. students who have passed their Preliminary Examinations and are within the specified time limits.
2. Ph.D. students who have passed their portfolio but have not yet taken their Prelims and are within the specified time limit.
3. Ph.D. students who have not yet passed their portfolio. This will apply to students in their second year; strong academic performance, satisfactory TA performance and evidence of research will be considered.
4. Students are allowed to hold internships through CPT during the academic year, as long as it does not interfere with their studies. In general, the total amount of hours per week for both CPT work and graduate assistant duties should not go beyond thirty. However, CPT students are at a lower priority than other unsupported students when TA positions are being filled.

*Notes:*

1. For Ph.D. students, departmental TA-ships will be limited to a total of eight semesters of support (whether as full-TA, half-TA or grader). Requests for an additional two semesters may be considered, but support will be provided only to exceptionally qualified students in such cases. In general, Ph.D. students will not be eligible for TA support past their fifth year in the CMSC graduate program. If a Ph.D. student was supported by the department while the student was in the M.S. program, those semesters will count towards the maximum limit. Any semester in which a student independently teaches a course does not count towards the maximum.
2. For M.S. students, departmental TA-ships will be limited to four semesters of support (whether full-TA, half-TA or grader) in compliance with priority #4 above.

3. In any given category, if there are more students than available lines, a combination of factors will be used in granting support, including publication history/research record, academic excellence, a strong letter of support from the advisor, excellence in past TA performance, and qualifications and knowledge for the course we need.

## 2.2 TA Responsibilities

1. As a TA, it is your responsibility to be fully familiar with the course material and all the assignments. You may have to spend time and effort in learning the material. As graduate students in computer science, you are expected to know (or otherwise learn) the material for the core and mainstream undergraduate courses. The department does its best in matching background knowledge and prior experience of students to their respective TA/grader assignments.

Students are expected to be available to assist with course/lab development. Inadequate prior knowledge of the course material is not an excuse for incompetence as a TA/grader.

2. **Students supported as full-time TAs are required to be full-time students, i.e. by completing nine graduate-level credits per semester.**
3. **TA renewal is not automatic.** Renewal is based on satisfactory academic and TA performance and other factors.
4. Students who receive an “academic warning” status for poor academic performance might lose their teaching assistantship in the semester that they are so classified. Students who receive an “academic probation” status will lose their teaching assistantship immediately.
5. Tuition remission will not exceed the minimum number of credits required for the M.S. degree, and will be granted only to courses that will count towards the degree.
6. Except under special circumstances, M.S. students with no TA experience must have grader experience to be considered for a TA.
7. TAs are required to be on campus by January 15 for Spring semester and by August 10 for the Fall semester. Exceptions have to be requested in writing at least 3 weeks before these dates. Teaching assistants who are not present on the first day of class risk having their TA appointment terminated!
8. If you feel that you are being overworked or abused as a TA or grader, please inform the Graduate Program Director or Department Chair right away. Please maintain a history of hours worked.

The following table describes the various tasks that a TA and a grader are expected to perform:

Duties	TA	Grader
Grade projects, homework, etc.	Yes	Yes
Hold office hours	Yes, for questions related to course lectures or grading	Yes, but only for questions related to grading
Prepare project or homework solutions	Yes	If an intrinsic part of understanding the grading for a particular subject
Proctor exams	Yes	Yes
Generate homework questions	Yes	No
Run labs, help sessions	Yes	No
Give prepared lectures	Only under unusual circumstances	No

### 3 Requirements for the M.S. Degree in Computer Science

The requirements for the M.S. degree are summarized in the table below.

Summary of Requirements for the M.S. Degree in Computer Science
24 credits of graduate coursework plus six credits of CMSC 799 (thesis option) or 33 credits of graduate coursework (non-thesis option).
Both options require the following mix of courses including CMSC 641 Algorithms, plus at least one from the “systems” set {CMSC 611 Computer Architecture, CMSC 621 Operating Systems, CMSC 661 Database, CMSC 681 Networks} and at least one from the “applications” set {CMSC 626 Computer Security, CMSC 634 Computer Graphics, CMSC 655 Numerical Computations, CMSC 671 Artificial Intelligence, CMSC 678 Machine Learning}
Certain restrictions apply:
<ul style="list-style-type: none"><li>• A minimum overall GPA of 3.0 is required to graduate</li><li>• Completing the program within a maximum of five years</li><li>• Completing each of the milestones according to the timeline specified below</li></ul>

For the M.S. degree in computer science, the student must earn a minimum of thirty (30) credit hours with the thesis option, or thirty-three (33) credit hours with the non-thesis option. The time limit for completing the degree is five years from starting the graduate program at UMBC.

The thesis option requires a minimum of eight (8) graduate courses (24 credit hours) and six (6) credit hours of thesis (CMSC 799). The thesis must be supervised by an approved CSEE graduate faculty member as the thesis advisor; and must, upon completion of the research, be defended with an oral presentation and accepted by the student’s M.S. thesis committee. The non-thesis option in the student’s field requires a minimum of eleven (11) graduate level courses (33 credit hours).

#### 3.1 M.S. Program Guidelines

The required slate of courses provide a minimal background in theoretical computer science, computer systems, and applications, while providing the flexibility to allow students to pursue their own interests. The required courses include:

- CMSC 641 Algorithms
- At least one from the set of “Systems” courses: CMSC 611 Computer Architecture, CMSC 621 Operating Systems, CMSC 661 Database, CMSC 681 Networks
- At least one from the set of “Applications” courses: CMSC 626 Computer Security, CMSC 634 Computer Graphics, CMSC 655 Numerical Computations, CMSC 671 Artificial Intelligence, CMSC 678 Machine Learning
- A grade of at least “B” must be earned in each of these courses.

The following restrictions apply.

1. At most six total credits of CMSC 699 (P/F) or CMSC 791 (P/F) or CMSC 696 (P/F) will be allowed.
2. A student may request to take a **maximum of six credits of coursework outside the department**. These courses must be at the graduate level and be approved by the student’s advisor and the Graduate

Program Director prior to registration. Requests for approval of non-CMSC course credits (at most 6 credits) should be submitted before registering for the non-CMSC course. The request form should be signed by the student's research advisor.

3. A regular graduate-level course taken for (P/F) credit may not be counted towards the degree.
4. At most six **graduate-level credits** taken at another university may be transferred to count towards the M.S. degree, provided that the credits have not been used for another degree. Credit transfer must be approved by the Graduate Program Director. To request a credit transfer, submit the Graduate School's Course Transfer Request form along with required documentation (see the Forms webpage of the CMSC graduate program).
5. All transfer course approvals and non-CMSC course credit approvals should be obtained before submitting the Graduate School's Fulfillment of Course Requirements for Master's Degree form to the CSEE Dept.
6. The Graduate School requires students to maintain a minimum GPA of 3.0. Students who fail to maintain the minimum GPA may be subject to academic probation and in the case of repeated poor academic performance, be subject to dismissal from the graduate program.
7. A graduate-level course that counts towards the M.S. degree may be repeated at most once, if necessary.
8. Leave of absence (LOA) will be granted at most three times during the entire M.S. degree. The LOA Request form should be submitted before the end of the add/drop period. Requests submitted after that period may not be approved. Please consult your research advisor before submitting this form.
9. Students admitted to the B.S./M.S. program at UMBC: Up to nine graduate credits taken as an undergraduate can count towards the M.S. degree. Once you enroll in the M.S. program, please check with the Graduate Program Director to ensure that the courses taken as an undergraduate will be eligible for the M.S. degree.

### 3.2 TA Support and M.S. Thesis

**A student in the M.S. program who has been supported by the department as a regular 20-hour TA for at least three semesters is required to complete a Master's Thesis for the degree.** The student should register for at least three credits of M.S. Thesis (CMSC 799) in the third semester.

For a Ph.D. student who does not have a prior M.S. degree in computer science and has been supported by the department as a regular 20-hour TA for at least three semesters, the following options apply:

1. If the student has passed the portfolio within the specified time limit, the student can apply for a M.S. degree with either the thesis or non-thesis option.
2. If the student has not passed the portfolio within the specified time limit and desires to take the terminal M.S. degree, then the student must follow the M.S. with thesis option.

### 3.3 M.S. Timeline/Milestones

The following list presents the milestones and deadlines for M.S. students currently in the CMSC graduate program.

1. **File the *Research Advisor Form*:** Select a research advisor by the second semester in residence and submit the form by April 15th (for students starting in the Fall semester) or Nov 15 (for students starting in the Spring semester).

**Part-time students:** File the form in the semester (by April 15 or Nov 15) in which the student has completed 15 credits towards the M.S. degree.

2. **Progression and Graduation Forms:** Follow all the Graduate School requirements for applying for the M.S. degree as well as departmental guidelines:

#### **M.S. Thesis Option**

1. *Research Advisor* form
2. *Fulfillment of Course Requirements* form
3. *Application for Diploma* form
4. *Nomination of Members for Final Examination Committee* form
5. *Certificate of Completion of M.S. Degree Requirements* form
6. *Certificate of Completion of M.S. Thesis* form

#### **M.S. Non-Thesis Option**

1. *Research Advisor* form
2. *Fulfillment of Course Requirements* form
3. *Application for Diploma* form
4. *Certificate of Completion of M.S. Degree Requirements* form

*Important Note:* If deadlines are not strictly met, you risk delaying your defense dates and/or your graduation!

## **4 Requirements for the Ph.D. Degree in Computer Science**

The following table summarizes the requirements for the Ph.D. degree in computer science.

Many of the items listed in this table are governed by further rules and specific time requirements. These details are specified in the appropriate subsection.

### **4.1 Coursework Requirements**

Each student must satisfy the minimum course requirements—eleven courses totaling 33 credits, excluding doctoral dissertation research credits. Of the 33 graduate-level course credits required for the Ph.D. degree:

- (a) The required courses include: CMSC 641 Algorithms, at least one from the set of “Systems” courses CMSC 611 Computer Architecture, CMSC 621 Operating Systems, CMSC 661 Database, CMSC 681 Networks, and at least one from the set of “Applications” courses CMSC 626 Computer Security, CMSC 634 Computer Graphics, CMSC 655 Numerical Computations, CMSC 671 Artificial Intelligence, CMSC 678 Machine Learning
- (b) A grade of at least “B” must be earned in each of these courses.
- (c) At most 6 credits total of CMSC 699 (P/F) and/or CMSC 696 (P/F) and/or CMSC 898 (P/F) can be counted.
- (d) No regular graduate course taken pass/fail (P/F) will be counted towards the 33 credits.

Summary of Requirements for the Ph.D. Degree in Computer Science
CMSC 641 Algorithms, plus at least one from the “systems” set {CMSC 611 Computer Architecture, CMSC 621 Operating Systems, CMSC 661 Database, CMSC 681 Networks} and at least one from the “applications” set {CMSC 626 Computer Security, CMSC 634 Computer Graphics, CMSC 655 Numerical Computations, CMSC 671 Artificial Intelligence, CMSC 678 Machine Learning}
at most 6 credits of some combination of CMSC 696, CMSC 699, and CMSC 898 at most 9 credits of non-CMSC courses with prior approval Ph.D. students are free to take more CMSC 699, 898 and 899, above the 33 credits required
A minimum GPA of 3.0
Passing the Comprehensive Portfolio
Passing the Preliminary Examination and Admission to Candidacy
18 credits of Dissertation Research (CMSC 899) taken after Admission to Candidacy, taken over at least two semesters
Completing and successfully defending the Dissertation
A minimum of three years of full-time graduate study or its equivalent, with at least one year of full-time study completed at UMBC. (The 18 credits of CMSC 899 satisfy this last requirement.)
Completing each of the milestones according to the timeline specified in Section 4.5 Ph.D. Timeline/Milestones

- (e) Students who earn their M.S. degree here will acquire many of these required credits.
- (f) CMSC 899 credits cannot be counted towards the 33 credits. Students may register for dissertation research credits (CMSC 899) after admission to candidacy. The Graduate School requires that students who are admitted to candidacy must register for nine CMSC 899 credits every semester until graduation. Under special circumstances, a student may request leave of absence during candidacy, by filling out a form obtained from the Graduate School website. A minimum of 18 credits of CMSC 899 are required for graduation; the 18 credits must be taken over at least two semesters.
- (g) Students with graduate courses from other universities should submit the Course Equivalency Request form soon after joining UMBC, preferably before their second semester. Such courses, if approved, are not officially transferred (i.e. they will not show up on your transcript) but will be counted towards the required Ph.D. course credits.
- (h) Requests for approval of non-CMSC course credits (at most nine credits) should be submitted before registering for the non-CMSC course. There is a form available for this request and should be signed by the student’s research advisor.
- (i) Students are required to maintain a minimum GPA of 3.0 (this is also a Graduate School requirement). Students who fail to maintain the minimum GPA may be

## 4.2 Comprehensive Portfolio

The comprehensive portfolio is intended to evaluate the understanding of core material and the readiness of doctoral students to pursue research. It consists of the following components:

1. Course performance
2. Research statement

3. Curriculum vita
4. An independently produced report
5. Two letters of support, one from the research mentor, one from another CSEE faculty member.

The CMSC Graduate Committee will make its decision about the student's continuation in the Ph.D. program based on evaluation of these materials. The student must submit the final portfolio before the end of the fourth semester for full-time students, or the end of the fifth semester for part-time students. Templates for the student research statement and faculty letters of support are available on the CSEE website. While it is expected that the portfolio will be strong across all areas, the portfolio will be evaluated as a whole, with excellent performance in one area possibly offsetting lower performance in another area.

#### 4.2.1 Course Performance

Demonstrated strong performance in graduate coursework is important for the foundation of knowledge needed to conduct research in computer science. It is recommended that Ph.D. students achieve a minimum GPA of 3.5 in regular computer science courses.

Should the student's GPA fall below the recommended level, this performance in coursework may be offset in the review of the overall portfolio with evidence that reflects one or more of the following areas: high levels of achievement in advanced coursework, strength in the written report, demonstrated superior proficiency in preliminary research, or other evidence of potential research excellence provided by the faculty or the student in the portfolio.

*For Transfer Students:*

1. **For the core courses:** You may submit a request for course equivalency for courses taken at other universities (with a minimum grade of B or equivalent). If the course syllabi, exams/projects, and evaluation criteria are comparable to the UMBC course, we will consider the grade in that course in the evaluation of the course requirement portion of the portfolio.
2. **For non-core courses:** The current standard policy as outlined elsewhere in this document applies.

#### 4.2.2 Written Report

The ability to analyze and synthesize ideas is critical for success in a doctoral program. All students must submit a written report on a topic approved by the research mentor. This can be a report from an independent study or independent project course, or it may come from preliminary research conducted by the student. The student must write the report independently. The report should demonstrate understanding of materials from more than one subfield in computer science and related disciplines. The student is encouraged but not required to include original results in the report.

The report can be up to ten pages, single-spaced. It should be in double-column format with the font for the main text no smaller than 11pt. You may follow the format instruction of any major Computer Science conference for other formatting specifics. As an example, the LaTeX style file and Microsoft Word template for IJCAI are provided at the graduate program website.

#### 4.2.3 Submission Details

1. The completed portfolios must be submitted by January 31 or August 31.

2. **Preliminary:** Full-time students must submit a preliminary portfolio at the beginning of their third Ph.D. program at UMBC. Part-time students must submit a preliminary portfolio at the beginning of their fourth semester in the Ph.D. program at UMBC. The preliminary portfolio is not required to include the written report. The support letter from the research mentor is required, additional letters are optional. Feedback will be provided on the preliminary portfolio so that students can strengthen the final submission.
3. **Final:** Full-time students must submit the final portfolio at the beginning of their **5th semester** at UMBC. Part-time student must submit the final portfolio at the beginning of their **6th semester**.
4. **The Graduate Committee will provide one of three decisions on the final portfolio: Pass, Deficient (certain conditions will be imposed for continuation in the program), or Fail.**
5. The final portfolio can be submitted ahead of schedule.

### 4.3 Preliminary Examination (Prelim) and Candidacy

Each student must select a dissertation advisor and a dissertation preliminary examination committee and must pass a two-part preliminary examination. In the first part, the student will present and defend his or her dissertation proposal to the Prelim Committee. In the second part, the Committee examines the student orally on his or her research area(s) to assess his or her ability to successfully complete the proposed research.

*Notes:*

1. The committee must consist of at least four members, of whom three (including the Chair) must hold regular Graduate faculty status. It is also recommended that the committee have at least one member outside the student's graduate program.
2. The intent is that there will be significant overlap between members of the Ph.D. Final Dissertation Committee and the Preliminary Examination Committee.
3. The *Ph.D. Preliminary Exam Scheduling Form* must be submitted at least thirty (30) calendar days prior to the examination date. A preliminary examination held without prior submission of this form will be considered invalid and the *Application for Candidacy* will not be processed.

**Ph.D. Candidacy:** After passing the prelim and completing the course requirements, the Graduate Program Director recommends to the Graduate School that the student be admitted to Ph.D. candidacy. **The student should submit the relevant *Application for Candidacy* form to the department for approval and forwarding to the Graduate School.** A student who has passed the preliminary exam and has finished 30 graduate credits may apply for candidacy in the semester that they are registered for the 11th course; the application must be submitted before the 10th day of the semester.

### 4.4 Dissertation Research

Each student will conduct and report on a significant original research project under the guidance of his or her dissertation advisor. This research must be completed and defended within four years of admission to candidacy. Students must be admitted to candidacy at least two full sequential semesters before the date on which the doctoral degree is to be conferred.

The doctoral dissertation must be an **original** and **substantive contribution** to knowledge in the student's major field and must demonstrate the student's ability to carry out a program of research and to report the results in accordance with standards observed in the recognized scientific journals related to that field.

**Residency Requirements:** A minimum of three years of full-time graduate study or its equivalent is required. At least one year of full-time study must be completed at UMBC.

## 4.5 Ph.D. Timeline/Milestones

The following list presents the milestones and deadlines for CMSC Ph.D. students. Failure to meet any of the deadlines could result in penalties including, but not limited to: loss of financial support, academic probation, and/or dismissal from the program.

Satisfactory evidence of research, strong academic performance and positive TA evaluations are some of the prerequisites for continued departmental TA support in the second and subsequent years.

1. **Determine Coursework:** Evaluate the course requirements and take appropriate courses in consultation with your temporary or research advisor.

If you already have an M.S. degree from elsewhere, determine which courses can be counted towards the Ph.D. degree course requirements and apply for formal course-equivalency credits.

2. **Research Experience Evidence:** By the end of the second semester in residence (May 31 for students who started in the Fall and Dec 31 for Spring starts), the student should submit: (i) a research statement outlining the student's research activities in the first year; and (ii) a statement of support from a faculty member potentially interested to be the student's research advisor. The research experience can be obtained by registering for at least 3 credits of CMSC 699 with a faculty member and/or working on research publications.

3. **Portfolio:** Successfully pass the portfolio by the end of the fourth semester in residence (fifth semester for part-time students). You are allowed at most two attempts within this specified time limit. For those who started prior to Fall 2005 and plan to take the examination model, these examinations are typically offered in the week before classes start.

4. **File the Research Advisor Form:** Select a research advisor by the fourth semester in residence and submit the form by April 15th (for students starting in the Fall semester) or Nov 15 (for students starting in the Spring semester).

5. **Research Progress Form:** After passing the comprehensive exam or final comprehensive portfolio, file a Research Progress form by April 15th each year until graduation. This report is for the period covering April 1st of the preceding year until March 30th of the current year. This includes a CV, research projects involved in, publications submitted or accepted, conferences attended/presented, awards received, etc. The progress form will also include a brief statement from the research advisor on the student's research progress.

6. **Preliminary Examination/Admission to Candidacy:** Successfully pass the Ph.D. Preliminary exam by the end of the fourth year (fifth year for part-time students) after starting the Ph.D. program. **The preliminary examination may be attempted only after approval of the final portfolio.** The *Preliminary Exam Committee Nomination* form should be filed at least 30 days prior to the prelim exam. The *Preliminary Examination Scheduling Form* must be submitted to the Graduate Program Director at least 30 days prior to the examination date.

After completing the 33 credits of graduate coursework required for the Ph.D. degree and passing the Ph.D. Preliminary Examination, the student must apply to the Graduate School for *Admission to Candidacy*. Once admitted to candidacy, the student must register for 6 credits of CMSC 899 each semester until graduation, unless leave of absence is granted (see above).

Now you have attained the so-called All But Dissertation (ABD) stage.

7. **Research Progress Form:** Continue to file the Research Progress form by April 15th each year until graduation.

8. **Final Dissertation Defense:** Successfully pass the Ph.D. dissertation defense after at least two semesters and within four years of passing the Preliminary exam.
9. **Graduate School Forms:** Follow all the Graduate School requirements for applying for the Ph.D. degree:
  - (a) *Nomination of Members for the Final Doctoral Examination Committee* (at least six months prior to final Ph.D. examination)
  - (b) Announcement of Ph.D. Dissertation Defense (ten working days prior to Ph.D. defense date)
  - (c) *Certification of Completion of Doctoral Dissertation* form
  - (d) *Application for Diploma* form

*Important note:* If the above deadlines are not strictly met, you risk delaying your defense date and/or graduation.

## 5 What I Wish I Had Known: Advice from Fellow Students

This section contains recommendations and information on a variety of topics regarding the CS graduate program. It was written for students by students, and contains information that enhances and supports material elsewhere in this program handbook. These recommendations are only guidelines, and do not reflect additional program requirements or CSEE policies.

First and foremost: Stay in Touch! **Once you decide to come to UMBC and have a myUMBC account, join the csee-grad-cs email list!** To do this, visit the website [www.csee.umbc.edu/systems](http://www.csee.umbc.edu/systems) and follow the link for CSEE Mailing Lists. This is the easiest and fastest way for the department to get important information to you!

### 5.1 Forms and Deadlines

**Advance Form Due Dates by 1-2 Weeks:** Most graduate school forms require the signature of the CMSC Graduate Program Director before they can be submitted. Obtaining this signature may take up to a week, so to avoid the graduate school forms being late, you must advance all due dates by 1-2 weeks. These due dates are listed on the graduate school website: [www.umbc.edu/gradschool](http://www.umbc.edu/gradschool).

We also recommend advancing the due dates of the CSEE department forms by 1 week, however, you can submit them closer to the deadline provided that you have already obtained all other signatures.

Forms that require the signature of the GPD may be presented during regular office hours, or given to the CMSC Graduate Program Coordinator.

Make and keep copies of forms that you submit! This includes web-based forms, or DocuSign actions.

### 5.2 Research and Lab Rotations

**Start Research Immediately:** We highly recommend that students work on research projects beginning with their first semester. You may get formal credit for these research projects by registering for CMSC 699 Independent Study/Research.

**Rotate through Several Labs:** Many other graduate programs contain a research rotation that moves first or second year Ph.D. students through two or three different research labs. This research rotation provides an invaluable chance to see how different labs work, interact with several professors, and gain exposure to a variety of areas.

Although there is no formal “research rotation” in place for the CS graduate program, we recommend taking 2-3 semesters of CMSC 699 and working with a **different** professor (in different labs) during **at least** two of those independent studies.

Although this limits the length of the independent study projects to a single semester, you will find the exposure helpful in your future research and in selecting an advisor. The knowledge of multiple CS subfields also encourages your research to be interdisciplinary.

You may also learn about other lab’s research and work your way into a lab by attending the regular lab meetings, which are generally open to visitors. We recommend you attend several labs’ meetings early in your graduate career.

Attending lab meetings is a good way of learning an area of computer science, and of getting to know research-active faculty. Working on projects in the various labs, whether for credit or not, makes the student better prepared to accept and perform the duties of research assistant (RA) positions.

**Stay Current in the Field:** We also highly recommend attending several department research colloquia each semester and browsing conference and journal publications through the UMBC library’s Research Port website to stay current with other CS research. We also recommend beginning to review conference and journal publications as soon as possible. Your advisor has many organizations asking them to review publications, and you should keep asking your advisor to let you review several publications each semester. This is a great way to learn about the publication process, learn how to get your research published, and enhance your curriculum vitae.

### 5.3 Socializing

**Build a Social Network:** It is vital to build and maintain a social network in the department and with other researchers in your field. Your contacts (especially with people outside the department) are very important for fostering research collaboration. Contacts within your department are important for immediate feedback on your research and for support during your graduate career.

**Work in a Social Environment:** It is very important for full-time students, especially Ph.D. students, to work on-campus and in the department. This also gives yourself and others opportunities to work together to understand concepts, and solve class or research problems. Such impromptu collaboration cannot be planned. Students that work in a social environment have a much higher success rate than those who work in isolation.

**Serve on Committees:** The more you “stick your neck out” and get your name around, the more likely that a faculty member will recommend you for service on department committees (such as the Promotions and Tenure committee, the Graduate committee, hiring committees, etc.), which will improve your curriculum vitae.

**Attend Department Social Events:** Attending department social events is another good way of making contacts within the department. It is also a good way of breaking the isolation of research.

**Attend Conferences:** The primary way to make contacts with other researchers in your field is by attending conferences. The Graduate Student Association provides funds for graduate students to attend conferences. Additionally, many conferences have student scholarships that you can apply to for travel funding. We recommend that students attend conferences whenever they have the chance to do so, and spend a good

portion of their time at the conference meeting researchers in their area. As a result of the ongoing public health crisis, many conferences are hybrid or entirely online, and as a result offer substantial registration discounts.

## 5.4 Fellowships and Internships

**Apply for Fellowships:** Fellowships provide a much more flexible method of funding than department assistantships, and are highly prestigious. During the first several years of your graduate study, you are eligible to apply to many of the fellowship programs. We recommend that you keep applying for fellowships as long as you are eligible.

**Do Internships:** Internships provide a great way to gain practical on-the-job experience, make industry contacts for future employment, and earn extra money. There are many internships in computer science that are available for either the summer months or longer periods of time extending into the semester.

Most TA-ships do not extend into the summer, so summer internships provide funding for the summer and allow you to save money for the school year.

**Apply Early to Internships:** If you are interested in a summer internship, you should apply for it the previous Fall semester. For most government internships that may require security clearance, you need to begin applying one year in advance.

## 5.5 Progress Checklists

**Use the CMSC Program Checklists:** The CS department website includes checklists for each CS graduate program to track your progress. Print out and keep the appropriate progress checklist up-to-date—it will save you stress and help you graduate on-time!

## 5.6 Academic Integrity

UMBC and the CSEE Department take academic integrity very seriously. We discuss this topic during graduate student orientation, and in our various classes. In short, work that you submit for credit needs to be *your* work. We of course encourage students to use the scholarly literature. However, quoting or paraphrasing such material without giving the author due credit is plagiarism, and is a form of academic dishonesty. Your instructor can give you guidance on what is and is not acceptable for specific assignments. For more general guidance, we invite you to review the [ACM Code of Ethics](#), and the [MIT Academic Integrity Handbook](#).

# 6 Facilities and Special Resources

The department's computing facilities workstations and server-class machines. The UMBC Office of Information Technology has workstations for general student use and several high-end machines. UMBC's Imaging Research Center also provides high-end graphics support including production quality input/output devices and production software (Wavefront, Softimage, and Alias).

## **CORAL (COgnition, Robotics, And Learning) Laboratory**

Contact: Dr. Tim Oates

Research in the Cognition, Robotics, and Learning (CORAL) lab seeks to understand how artificial systems can acquire grounded knowledge from sensori-motor interaction with their environment that enables cognitive activities, such as natural language communication and planning.

URL: <https://coral-lab.umbc.edu/>

## **Cyber Defense Lab (CDL)**

Contact: Dr. Alan Sherman

The Cyber Defense Lab focuses on research related to computer systems security, cryptology, protocol analysis, secure voting, and other cybersecurity areas. It provides an isolated environment where students are provided a unique opportunity to research topics that would ordinarily be considered too dangerous to network and system resources to be investigated in other computer labs.

## **DAMS (DAta Management and Semantics) Group**

Contact: Dr. Roberto Yus

In the DAMS group we deal with upcoming challenges in Internet of Things (IoT) data management, especially due to the massive scale and heterogeneity of data and strong privacy requirements. The main areas of research of the DAMS group are: Data Management, AI (Knowledge Representation and Reasoning), Privacy, and the IoT.

URL: <https://damslabumbc.github.io/>

## **Data and Resource Engineering and Management (DREAM) Lab**

Contact: Dr. Konstantinos Kalpakis

The mission of the DREAM Lab is to design algorithms and develop system architectures for the engineering of data systems and the management of distributed computing system resources. Research themes include managing and mining spatio-temporal multimedia scientific datasets, data replication and query processing, resource management in distributed systems, sensor networks, streaming datasets, and system security .

## **Discovery, Reverse Engineering and Analysis of Malware (DREAM) Lab**

Contact: Dr. Charles Nicholas

The Malware Research group explores the intersection between data science and cybersecurity, with an emphasis on machine learning applications in the field of malware analysis on a large-scale. We are interested in problems such as clustering of malware into families, detection of malware in otherwise benign systems, and evaluation of malware detection systems. These two DREAM Labs share ITE 366.

## The eBiquity Group

Contacts: Drs. Tim Finin, Anupam Joshi

The eBiquity Group studies the interactions between mobile and pervasive computing, the semantic web, cognitive systems and security. It includes over 20 students conducting research and pursuing graduate or undergraduate degrees. Research is characterized by fundamental advances in underlying areas—distributed systems, wireless networking, databases technology, multiagent systems, knowledge representation and reasoning, machine learning, and security—explored and evaluated through their application to problems that matter. The eBiquity groups' research is supported by corporate and government sponsors and partners that include NSF, DARPA, NASA, NIST, DoD, IBM, HP, Fujitsu, Nokia, and AetherSystems.

URL: <http://ebiquity.umbc.edu/>

## Interactive Robotics and Language (IRAL) Lab

Contacts: Dr. Cynthia Matuszek, Dr. Frank Ferraro, Dr. Don Engel

We study robotics and natural language processing, with the goal of bringing the fields together: developing robots that everyday people can talk to, telling them to do tasks or about the world around them. This approach to learning to understand language in the physical space that people and robots occupy is called grounded language acquisition. Our goal is to build robots that can perform tasks in noisy, real-world environments, instead of being pre-emptively programmed to handle a fixed set of predetermined tasks.

URL: <https://iral.cs.umbc.edu/>

## VANGOGH Laboratory: Visualization, Animation, Non-Photorealistic Graphics, Object-Modeling, and Graphics Hardware

Contacts: Dr. Marc Olano

The VANGOGH laboratory provides a specialized environment for research in computer graphics. The pillars of the lab are understanding of data using visualization and interactive graphics using graphics hardware. Between these two areas, the VANGOGH lab fosters research in realistic and non-realistic artistic graphics, procedural shading, computer animation, object modeling and representation, and design and use of graphics hardware. Research in the VANGOGH laboratory has been supported by ARDA, NSA and NSF.

URL: <https://vangogh.umbc.edu/>

## 7 Graduate Courses in Computer Science

Some of the courses listed in the [UMBC Graduate Catalog](#) are offered frequently, and others are taught rarely if ever. The frequencies of offering, as listed, are based on recent history and are not binding on the program.

Consult the UMBC Graduate Catalog for official course descriptions. The information given below may be useful for planning.

Graduate students in CMSC may take elective courses in the CYBR, DATA, ENGM, SYST, HIT, IS, or SENG, subject to certain restrictions. In general, no more than six credits from other programs may be applied to the MS degree. Contact the Graduate Program Director for details.

Different sections of CMSC 691 may be taken, with each counting towards the MS or PhD degrees as separate courses. The [UMBC Schedule of Classes](#) can be examined to see what has been offered in the recent past, and (hence) what will likely be offered in the near future.