PROGRAM POLICY DOCUMENT FOR COMPUTER SCIENCE (Current)	PROGRAM POLICY DOCUMENT FOR COMPUTER SCIENCE (Revised)
The Department of Computer and Information Sciences offers programs leading to the PhD and MS degrees in Computer Science. Computer Science is a vigorous and exciting field of research and study that continues to grow in importance. Computer science programs are broad in scope and deal with software and hardware technology, the theory of computation, scientific computing, and their applications. Departmental research strengths include artificial intelligence (machine learning, multi-agent systems, planning and problem solving), bioinformatics, computational theory (computational learning theory, design and analysis of algorithms, computability theory), compiler optimization and compilation for parallel machines, natural-language processing, (discourse and dialogue, generation, information extraction, summarization), systems (parallel and distributed computing, grid and volunteer computing, algorithm and architecture design for massive parallelism), networks, (distributed computing, transport layer protocols, mobile and wireless networks, algorithm and architecture design for massive parallelism, networks management, security performance modeling, simulation), graphics and computer vision, rehabilitation engineering (augmentative communication, speech recognition and enhancement), software engineering (program analysis and testing), and symbolic mathematical computation (algebraic algorithms, parallelization), and robotics.

The CIS graduate program provides a solid foundation in the fundamental areas of computer science and, in addition, provides numerous advanced courses and seminars to acquaint the student with current computer | The Department of Computer and Information Sciences offers programs leading to the PhD and MS degrees in Computer Science. Computer Science is a vigorous and exciting field of research and study that continues to grow in importance. Computer science programs are broad in scope and deal with software and hardware technology, the theory of computation, scientific computing, and their applications. Departmental research strengths include artificial intelligence (machine learning, multi-agent systems, planning and problem solving), bioinformatics, computational theory (computational learning theory, design and analysis of algorithms, computability theory), compiler optimization and compilation for parallel machines, natural-language processing, (discourse and dialogue, generation, information extraction, summarization), systems (parallel and distributed computing, grid and volunteer computing, algorithm and architecture design for massive parallelism), networks, (distributed computing, transport layer protocols, mobile and wireless networks, algorithm and architecture design for massive parallelism, networks management, security performance modeling, simulation), graphics and computer vision, rehabilitation engineering (augmentative communication, speech recognition and enhancement), software engineering (program analysis and testing), and symbolic mathematical computation (algebraic algorithms, parallelization), and robotics.

The CIS graduate program provides a solid foundation in the fundamental areas of computer science and, in addition, provides numerous advanced courses and seminars to acquaint the student with current computer |

science research. The main difference in objectives between the MS and PhD programs is that the PhD is designed to prepare students to conduct advanced research.

ADMISSION REQUIREMENTS

Applicants must also satisfy the following general departmental requirements for admission to the CIS graduate program:

1. The equivalent of a bachelor's degree at the University of Delaware. A minimum grade average of 3.2 in the major field of study and an overall cumulative index of 3.0 is required.
2. Scholarly competence in mathematics and computer programming. Applicants are expected to know the material covered by at least one undergraduate course in each of the following topics:

    *   structured high-level language programming,
    *   data structures,
    *   computer architecture,
    *   operating systems,
    *   analysis of algorithms.

    Additionally, applicants must have completed the equivalent of at least four undergraduate courses in the following list:
    *   calculus,
    *   discrete mathematics,
    *   probability and statistics,
    *   mathematical logic,
    *   comparable formal subjects, such as Theory of Computation.

3. Strong applicants lacking prerequisites are occasionally

admitted provisionally on the condition that they complete specified undergraduate courses with a B or better in addition to the normal degree requirements. Students without formal course work covering the prerequisites who have gained equivalent knowledge through work or other experience should submit appropriate evidence.

4. Minimum scores of 153, 155, 4.0 (if taken prior to 08/01/11 then 500, 700 and 4.0) on the verbal, quantitative, and analytical writing sections, respectively, of the Graduate Record Examination Aptitude Test. The GRE subject test is not required.

5. If the applicant has completed graduate courses in computer science beyond the bachelor's degree, the grades earned in these courses will be reviewed and considered in the admission decision. A minimum grade of 3.0 (B) in each of these courses is required.

6. For applicants whose first language is not English, and who have not received a degree at a U.S. college or university, a minimum score of 79 of the TOEFL (Test of English as a Foreign Language) or 6.5 of the IELTS (International English Language Testing System) is required for admission without financial aid. Minimum score of 100 of the TOEFL (Test of English as a Foreign Language) or 7.5 of the IELTS (International English Language Testing System) is required for admission with a teaching assistant.

7. Three letters of recommendation from professors (preferably), employers, or others who are able to

assess the student's potential for success in graduate studies. The University of Delaware recommendation form should be used whenever possible. Any attached letter should be a signed original and, preferably, on colored letterhead from the author's institution.

8. *It is suggested, but not required, that students provide official documentation of their relative ranking within their class.*
9. *A Master's degree is not required for admission to the PhD program. Strong applicants with a Bachelor's degree are encouraged to apply directly for admission to the PhD program.*

Note: Admission to the graduate program is competitive. Those who meet stated minimum requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths.

REQUIREMENTS FOR THE M.S. DEGREE

An Application for Advanced Degree for the Master of Science degree should be filed with the Departmental Graduate Committee no later than the beginning of the semester in which the degree is expected. Application forms are available from the Office of Graduate and Professional Education.

A. Departmental General Requirements. At least 9 credits of the 30 credits used to satisfy the degree requirements must be 800-level CISC courses. Credits for independent study, research and master's thesis do not count towards this

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assess the student's potential for success in graduate studies. The University of Delaware recommendation form should be used whenever possible. Any attached letter should be a signed original and, preferably, on colored letterhead from the author's institution.

8. *It is suggested, but not required, that students provide official documentation of their relative ranking within their class.*
9. *A Master's degree is not required for admission to the PhD program. Strong applicants with a Bachelor's degree are encouraged to apply directly for admission to the PhD program.*

Note: Admission to the graduate program is competitive. Those who meet stated minimum requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths.

REQUIREMENTS FOR THE M.S. DEGREE

An Application for Advanced Degree for the Master of Science degree should be filed with the Departmental Graduate Committee no later than the beginning of the semester in which the degree is expected. Application forms are available from the Office of Graduate and Professional Education.

A. Departmental General Requirements. At least 6 credits of the 30 credits used to satisfy the degree requirements must be 800-level CISC courses. Credits for independent study, research and master's thesis do not count towards this

requirement.

1. *A* minimum grade average of 3.0 is required in the graduate courses used to satisfy the degree requirements. The University also requires a minimum GPA of 3.0 in all graduate courses taken including any not used towards the required 30 credits. Students are encouraged to explore graduate courses (600 level or higher) in other areas such as electrical engineering, mathematics, linguistics, statistics, and business and economics. Graduate courses outside of Computer and Information Sciences to be used towards meeting degree requirements require written approval of the Graduate Committee.
2. *Students* are encouraged to participate in the research activities of the Department by taking CISC 666, CISC 866-Special Problems and Independent Study or CISC 868-Research. This is especially true of potential PhD students. No more than three credits of ClSC 666, CISC 866 or CISC 868 (combined) may be applied toward meeting the degree requirements or used in satisfying the required minimum grade average without prior written approval from the Graduate Committee. (Exception for master's thesis students-see later section.)
3. **Each semester** all graduate students must explicitly register for CISC 890 - Colloquium and sign up and satisfactorily participate in one of the Department's special research interest groups. One faculty member for each group will be responsible for overseeing satisfactory participation for each student on an

individual basis (e.g., simply attending, giving a presentation) and will assign a pass/fail grade accordingly. Each MS student needs 3 semesters of passed CISC 890 to graduate. Special arrangements for part-time students and those who finish in less than 3 semesters will be made.

B. Computer Science Course Requirements for the M.S.

1) Breadth requirement courses: All students must take four breadth courses, one in each of the four areas.

Area 1: Theory
CISC601: Elements of the Theory of Computation
CISC604: Logic in Computer Science
CISC621: Algorithm Design and Analysis
Area 2: Systems and Networks
CISC650: Computer Networks II
CISC662: Computer Systems: Architecture
CISC663: Operating Systems
CISC672: Compiler Construction
Area 3: Software
CISC640: Computer Graphics
CISC675: Object Oriented Software Engineering
CISC681: Artificial Intelligence
Area 4: Information
CISC636: Bioinformatics
either Machine Learning or CISC683: Introduction to Data Mining
CISC637: Database Systems
CISC642: Introduction to Computer Vision

2) All students must take a graduate course in either algorithm design and analysis (e.g., CISC 621) or in theory of computation (e.g., CISC 601).
3) A grade of B- or better is required in

each of the four breadth courses taken to meet the breadth requirement.
4) Substitutions or satisfaction through courses taken at another university are permitted, but require written approval by the Graduate Program Committee.

C. Master's Thesis Option

A master's thesis is optional; successful completion requires a combination of six credits of CISC 868 and/or CISC 869, which are included in the thirty credits needed for the MS degree. Students with a high GPA and/or motivation and ability to perform research are strongly encouraged to get involved in a research project. One way to do this is to complete an MS thesis.

Each student working on a master thesis, with the advice of the master's thesis advisor, needs to establish an advisory committee. The committee consists of 2-3 members of the faculty approved by the CIS Graduate Program Committee. The committee chair is a faculty member in the CIS department, and the thesis advisor. At least one other member should be a faculty member in the CIS department. The proposed advisory committee must be submitted to the Graduate Program Committee for approval. Upon completion of the master's thesis, a final oral examination must be passed, consisting of a defense of the master's thesis. The final oral examination is directed and evaluated by the student's advisory committee.

Admission to the master's degree program does not guarantee that a student can pursue a thesis since more students may desire to do a thesis than there are faculty available to guide them. A thesis student may obtain three credits of CISC 666, CISC 866, CISC 868 in addition to the six credits of CISC 868 and/or CISC 869 applied toward the

MS thesis only if the areas of study do not overlap, as approved by the CIS Graduate Committee. The MS thesis student must still satisfy all other Department requirements.

REQUIREMENTS FOR THE Ph.D. DEGREE

In addition to satisfying the general requirements of the University, candidates for the Doctor of Philosophy degree must satisfy several departmental requirements, Toward meeting these requirements, each student has to first pass a Preliminary Examination, consisting of two components: Preliminary Breadth Requirements and a Preliminary Research Requirement. A student must complete all the requirements of the Preliminary Exam within two years of starting as a CIS graduate student. This includes both the course and the research components of the preliminary exam.

For a student who obtained an MS degree from our department, then went away for a period of time, and submitted a fresh application for admission to our PhD program, the clock will start when the student enters the PhD program.

A student who has not completed the requirements within the two-year period will be recommended for dismissal from the PhD program through the Office of Graduate Studies. An exception may be granted by the GPC under exceptional circumstances such as serious illness, injury, or other extenuating circumstances.

If an MS student decides to transfer to the PhD program after more than two semesters in the MS program, that student is allowed one extra semester (beyond four semesters) to complete the Prelims Exam requirements.

One objective of these requirements is to provide flexibility in designing an appropriate plan of study. The PhD is an individualistic degree. As soon as possible in the program, each candidate should find a faculty member to act as adviser and be in charge of the candidate's research.

The candidate and advisor design a plan of study that satisfies the University and Department requirements. The Department requirements as listed below specify a minimum amount of necessary work. It is expected that additional course work will normally be required by the adviser. A minimum set of requirements provides a large degree of flexibility for each individual candidate.

Departmental General Requirements for the Ph.D.
Course Work
1) A candidate with a master's degree in a related field (e.g., EE, Math) must put together a program that meets the CIS Graduate Committee's approval. Using courses taken for the related graduate degree plus courses taken at Delaware, the candidate must satisfy the Computer Science course requirements for the MS degree, and show the equivalent of the 30 credit MS degree offered by the CIS Department.

2) Each candidate is required to complete a minimum of 6 additional credits beyond the master's degree. The 6 additional credits do not include the following courses: CISC 666, CISC 866, CISC 868, CISC 969. Normally, in meeting the University's requirement for a major area, a candidate will be required by the adviser to complete more than 6 credits. (Note that the University requires a candidate to complete 9 credits of CISC969 after admission to candidacy.)

Research Ability: PhD candidates are strongly encouraged to get involved in research as early as possible in their program. As part of the process of finding an adviser, and as early as possible, candidates must demonstrate the potential to perform research as formalized in the Research Preliminary Requirements.

PhD Preliminary Breadth Requirement

1) Each student must take 5 breadth courses, subject to the following constraints:
At least one of "CISC 621: Algorithm Design and Analysis" or "CISC 601: Elements of the Theory of Computation" must be included. At least one course from each **breadth area** must be included.

The **breadth areas** and the **breadth courses** included in each area are as follows:
Area 1: Theory
CISC601: Elements of the Theory of Computation
CISC604: Logic in Computer Science
CISC621: Algorithm Design and Analysis
Area 2: Systems and Networks
CISC650: Computer Networks II
CISC662: Computer Systems: Architecture
CISC663: Operating Systems
CISC672: Compiler Construction
Area 3: Software
CISC640: Computer Graphics
CISC675: Object Oriented Software Engineering
CISC681: Artificial Intelligence
Area 4: Information
CISC636: Bioinformatics
either Machine Learning or CISC683: Introduction to Data Mining (i.e., at most one of these two courses can be used to fulfill the breadth requirement)
CISC637: Database Systems
CISC642: Introduction to Computer Vision

Research Ability: PhD candidates are strongly encouraged to get involved in research as early as possible in their program. As part of the process of finding an adviser, and as early as possible, candidates must demonstrate the potential to perform research as formalized in the Research Preliminary Requirements.

PhD Preliminary Breadth Requirement

1) Each student must take 5 breadth courses, subject to the following constraints:
a) At least one of "CISC 621: Algorithm Design and Analysis" or "CISC 601: Elements of the Theory of Computation" must be included.
b) At least one course from each **breadth area** must be included.

The **breadth areas** and the **breadth courses** included in each area are as follows:
Area 1: Theory
CISC601: Elements of the Theory of Computation
CISC604: Logic in Computer Science
CISC621: Algorithm Design and Analysis
Area 2: Systems and Networks
CISC650: Computer Networks II
CISC662: Computer Systems: Architecture
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CISC672: Compiler Construction
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Area 4: Information
CISC636: Bioinformatics
either Machine Learning or CISC683: Introduction to Data Mining (i.e., at most one of these two courses can be used to fulfill the breadth requirement)
CISC637: Database Systems
CISC642: Introduction to Computer Vision

The list of breadth courses is subject to change as approved by the CIS faculty.

A student may take more than 5 courses in the breadth list. In any case, the student will notify the Graduate Program Committee (GPC) which 5 courses will be used to satisfy the breadth requirement. The **GPA for the 5 breadth courses must be at least 3.5**. This GPA computation will use the University's official assignment of points to letter grades, published in the University catalog. Moreover, each of the 5 grades must be **at least B-**.

The list of breadth courses is subject to change as approved by the CIS faculty.

2) A student must obtain an average GPA of 3.5 or higher over these 5 breadth courses. Courses that will be counted toward this requirement must be pre-declared as explained below.

3) At the start of every semester, a student will have to declare the courses he/she wishes to take that semester for satisfying the Prelims course component.

4) A student can change courses to be counted for the Prelims course component during the free drop/add period but **not** beyond that time. The student can also drop a course for this component during the free drop/add period. After this period, the course will be counted toward the Prelims course component and the grade in that course will be counted toward the required average of 3.5. A grade of L or W will count the same as an F grade.

5) None of the courses counted toward the Prelims course component can be a repetition of a course previously taken or of a course previously audited. If a student takes the same course more than once, only the grade on the *first* attempt may be counted towards the Prelims course component. The only exception is as specified in *item 6)* below.

6) Once the 5 required Prelims courses are completed, a student who has a grade point average of less than 3.5 on these courses may take, with the advisor's approval, at most one additional course from the approved list of Prelims courses, or petition the GPC to use a course already taken from that list. In this case, the additional course may be used

to substitute one of the original five courses making sure that the five courses used for the Prelims satisfy all the breadth requirements. This additional course may be a repeat of the course being substituted, with approval of the instructor teaching the repeated course. In exceptional situations, with strong advocacy from the advisor and with justifiable reasons, the GPC may allow one extra semester beyond the four semesters to complete this sixth course.

Opting out

A student who has taken equivalent graduate level course(s) at another university may petition the GPC to "opt out" of breadth courses. A student wishing to opt out of course(s) must send an email to the GPC within their first semester.
The email must list the breadth course(s) the student wishes to opt out of. For each such course, this email should give details about the equivalent course taken: the name and number of the course, the institution, the grade received, and a brief description of the course.

The GPC will decide on the appropriate action for determining if the student can opt out of the course. This will usually involve giving the student an exam. This may involve finding a faculty member in the relevant area to administer the exam. The exam may be an oral exam or a written exam. It may be the final exam in the breadth course at the end of the current semester. The GPC will issue its decision for each course, either "opt-out granted" or "opt-out not granted", by email to the student. The opt-out courses are not used in the breadth GPA computation. A student who has opted out of a course still has the option to take the course (for example, to receive a grade that will improve their

Opting out

A student who has taken equivalent graduate level course(s) at another university may petition the GPC to "opt out" of breadth courses required toward the Preliminary Exam breadth component. A student wishing to opt out of course(s) must apply for the opt-out within his/her first semester.

I. The request for opt-out should be sent as early as possible after the student joins our PhD program, but in any case should be sent no later than the end of the first semester. We strongly suggest that it should be initiated within the first four weeks of the student's arrival at UD.

II. All communication with the GPC regarding the Prelims and the opt-out process should be done directly by the student in question and not by the student's advisor.

III. The student should send a separate email to the GPC for each course for which opt-out is being requested. Attachments may be used if necessary, but the student should avoid sending multiple emails for the same course

breadth GPA).	IV. The opt-out request must include the following information: 1) Name and number of the Prelims breadth course at UD for which opt-out is requested. 2) Name, number, and official course description, of a similar course taken by the student at another institution, as a basis for the opt-out request. 3) Name of the institution where the course was taken. 4) The language in which the course was taught. Also indicate what is the normal language of instruction for most courses at that institution. 5) A copy of the student's transcript at that institution. 6) The dates when the course was taken (including starting and ending dates), whether it was for a semester/quarter/trimester etc., number of credits, and the grade obtained in that course. 7) The grading scheme at the institution where the course was taken, e.g., whether letter grades A, B, C, etc. are used, whether or not plus/minus grading (e.g. B+, B-) is used. A Web URL is sufficient if it points directly to the relevant information. 8) The grading criterion used by the course instructor, if such criterion is made public by the instructor, e.g., if an A grade corresponds to a certain minimum percentage score (such as 95%) in the course, or if the grading

is done on a curve.

9) The textbook used in the course (if any) and a detailed syllabus for the course (a short paragraph description as found in the course catalog is not sufficient).

10) Any other relevant information that the student can provide about the course (such as the course web site, homeworks /exams /projects etc.) that would improve the student's case for opt out.

V. For a course to even be considered as a basis for an opt-out, certain MINIMUM requirements must be met:

1) The course at the other institution must be a graduate course.

2) The student must have obtained a minimum grade of A- (or equivalent to A-) in the course. While different institutions adopt different grading schemes, the GPC will make the final determination of whether the student's grade meets this criterion.

The requirements listed above are minimum requirements. Meeting them means the GPC will consider the opt-out request, but it does not imply that the opt-out request will be granted.

VI. The GPC will decide on the appropriate action for determining if the student can opt out of the course. In some cases, the GPC may decide to deny or grant the opt-out request outright. In most cases, the student will be asked to take an exam on the course material.

VII. If the GPC decides that the student must take an exam, the GPC will forward the

	request to a faculty member in the relevant area to administer the exam. Normally this will be the faculty member teaching the course in the current semester. If the course is not being taught in the current semester, or if the current course instructor is not available for some reason (e.g. is on sabbatical), the GPC may request another faculty member who has recently taught the course or who will teach it in the next semester. As far as possible, the GPC will avoid sending the request to the student's research advisor.
	VIII. The GPC's request to the instructor asking for an evaluation the student will include the student's transcript, all the course material and any other relevant course information provided by the student. The request will also include a copy of this document describing the evaluation process.
	IX. The instructor asked to do the evaluation will meet with the student as early as possible and explain the testing process to the student. The instructor will give an exam to the student to evaluate whether the student's knowledge of the course material is equivalent to that reflected by a grade of B+ or above in the equivalent UD CISC course.
	X. Below are the standard guidelines for the testing process:
	1) The exam given to the student may be oral or written.
	2) The exam is expected to test the student's knowledge of the entire course material. The exam may be the final exam in the breadth course given at the end of the current semester, or it may be a combination of mid-semester and final

A student who successfully opts out of all courses needed to fulfill the breadth requirement is deemed to have fulfilled the breadth requirement (even though there is no GPA to compute).	A student who successfully opts out of all courses needed to fulfill the breadth requirement is deemed to have completed the requirements for the Preliminary Breadth Requirement component of the Preliminary Exam (even though there will be no GPA to compute).
PhD Preliminary Research Requirements	**Preliminary Research Requirements**
1) Each student must find one CIS faculty member as advisor and another CIS faculty as member to form a committee supervising the Preliminary Research Requirement. The advisor's primary appointment must be in CIS. It is expected that the advisor will become the student's PhD thesis advisor. After discussion with the committee, the student	**1) Advisor:** To complete the PhD Preliminary Exam research component, a student must find a CIS faculty member to be his/her advisor and complete a research project as described below under the supervision of the advisor. The advisor must be a tenure-track faculty member with a primary appointment in CIS. It is expected that the advisor will eventually become the

prepares a **written proposal** for their project. The proposal should describe an area and outline the project the student will carry out in that area. The description may include some specific papers or sections of books that the students will read. It may describe a particular problem the student will work on. It is an option that, with the consent of the advisor, the student may register the project as a 3-credit independent study. The proposal will be made available to all faculty in the department through a **web site**. The student will produce a **written report** on the project. Typically, the length of the report is between 10 and 20 pages. The project (and the written report) must include a thorough **literature search** and a summary of the current state of knowledge in the area.

The project (and written report) must also include some **original contribution**. The exact form of this contribution is up to the student and the committee. Examples include:

- Application of existing ideas to new examples
- The development of a prototype (software) tool which realizes existing ideas or extends them in some way
- Some theoretical or mathematical extension of existing ideas
- A novel analysis of existing data
- A simple experiment.

Once the written report is deemed complete by the committee, the student, in coordination with the committee, will **schedule a presentation/oral exam** at least 2 weeks in the future. At least 2 weeks prior to the presentation/oral exam, **the written report will be made available to all faculty in the department on the same web site used to serve the proposals**. The web site will also give the time and location of the exam.

student's thesis advisor.

2) **Committee:** Before starting on the research project, the student must form a committee, which will oversee and approve the project. The committee must be declared in advance and approved by the GPC; a committee member may be changed only with approval of the GPC and for valid reasons only. The advisor is a member of this committee. The committee will have at least one more member in addition to the advisor and co-advisor if any. At least one of the additional members must also be a tenure-track faculty member with a primary appointment in CIS.

3) **Research Project:** The research requirement should be a uniformly rigorous requirement for all students taking the Prelims Exam. Its purpose is to assess the student's ability to conduct and to formally write and report basic level research. The research does not have to be novel. It needs to show that the student can understand an area, synthesize material he/she reads within that area, and come up with his/her ideas – either as a new project or as a synthesis pointing out pros and cons of the current state-of-the-art and future directions.

The research project must include a thorough literature search and a summary of the current state of knowledge in the area. In addition, it must also include some original contribution. The exact form of this contribution may vary from one student to another. Examples include:
- Application of existing ideas to new examples
- The development of a prototype (software) tool which realizes existing ideas or extends them in some way
- Some theoretical or mathematical extension of existing ideas
- A novel analysis of existing data

2) Presentation/Oral Exam

The "audience" must consist of at least the committee, but it may also be much larger (e.g., the presentation may take place in one of the "SIG" seminars.) The exact arrangements are up to the advisor, but at the very least, any faculty member in the department who requests to attend the presentation and exam must be allowed to do so.

The presentation will be followed by a question and answer period, where all members of the audience may ask questions. After the question and answer period, everyone will be asked to leave except the student and the committee. The committee members may then ask further questions. Next, the student is asked to leave and the committee discusses the student's performance. The committee determines if the student has passed or failed the exam and notifies the student and the GPC of their decision. If the project is registered as an independent study, the committee will also give a letter grade; it is up to the committee to decide what letter grade is considered as passing the exam. If the student fails the exam, they are allowed to retake it [one more time]. In the next attempt, the student may choose to improve the work of the previous attempt as required by the committee (the option of registering as 3-credit independent study does not apply) or start fresh with different faculty members. If the student has not passed the exam within 15 weeks after the submission of the proposal, the student is deemed to have failed the exam.

- An original synthesis of existing ideas
- A simple experiment

4) **Research Proposal and Report:** The student in consultation with the committee will prepare a Research Proposal at the start of the research project. This proposal must be no more than two pages long, not including the bibliography. It should contain a brief summary of the project, motivation for the work, a description of what work will be performed, and the expected results.

At the end of the project, the student will prepare, under the supervision of the advisor, a written Research Report describing the results of the project. The Research Report must be no more than 20 pages long, not including the bibliography, and it must adhere to common standards for a good technical report. These include: Good use of language and grammar; proper attribution to source and proper use of citations; proper document structure (Introduction, Conclusions, and the sections in between); proper use of figures, tables, captions, and references to such objects from the write-up.

The report should not simply be a recycled version of a paper that has been submitted for publication or that has other co-authors. Instead, the student should make an effort to write a report that addresses the issues described in the research proposal.

5) **Oral Exam:** The student must present the results of the research project and results in a 30 to 45 minute presentation given during an Oral Exam. The Oral Exam should be scheduled as a SIG presentation, whenever possible. It should be open to all and should include the committee members in the audience.

3) Other Preliminary Constraints

Time limit:
The student must fulfill the Preliminary Requirements within 2 years from entering the graduate program. Except in exceptional circumstances (as determined by the faculty), if a student has not completed the Preliminary Requirements within the allowed time limit, the student will be dismissed from the PhD program. Exceptional circumstances might include serious illness or injury, or other personal issues.

Finding advisor:
The student must also find a faculty member who agrees to serve as the student's thesis advisor within the time frame.

Certification of completion of Preliminary Examination:
When a student believes s/he has fulfilled all parts of the Preliminary Examination, the student will notify the GPC by email. The email should list the 5 breadth courses being used to meet the breadth requirement, the grade received in each course, and the GPA for the 5 courses. It should also give the title of the Research Project, the name of the committee members, and the date of the passing oral exam. Finally, it should include the name of the faculty member agreeing to serve as the student's thesis advisor. (Typically, the thesis advisor will be the advisor from the research project.) The advisor should be cc-ed on this email. The GPC is ultimately responsible for determining that a student has completely fulfilled the Preliminary Requirements, and will communicate its decision by email to the student and the advisor.

6) Timeline: All Prelims Exam research projects will be conducted during regular semesters, either Spring or Fall. The student must provide a research proposal and decide the date, time, and place of the oral exam in consultation with the committee and provide this information to the GPC Chair before the end of Week 6 of the semester. All oral exams will be scheduled during the last 5 weeks of the semester (up to the last day of final exams). To the extent possible, they will be advertised as a SIG presentation in an appropriate SIG. The final report of the student must be given by the student to all committee members and published online at least 2 weeks before the date of the oral exam.

Nothing in this requirement prevents a student from starting work on the research project in consultation with his/her advisor in advance of the semester in which the project will be conducted. In fact, students are encouraged to lay the groundwork for their projects before the semester starts.

7) Evaluation: The student's committee will evaluate the written report and the oral exam using a checklist with numeric or letter grades. This checklist will be developed by the GPC. Each member of the committee must independently assess the student's performance using this checklist and make a recommendation on Pass / Conditional Pass / Fail of the student. These evaluations and recommendations are sent to the GPC by the advisor immediately after the oral exam. A committee member may recommend a Conditional Pass in situations where the committee member feels that there was a deficiency in the written report or the oral exam or both which may be corrected by the student within a four-week period and which is not serious enough to warrant a Fail.

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8) A student who anticipates not meeting the timeline specified in Item 6 above or failing the exam due to serious illness, injury, or other extenuating circumstances may request either an extension or a second opportunity to take the research component. The student should submit a letter to the department's Graduate Program Committee as early as possible – and before the end of the two-year period, detailing the issue and clearly stating the requested accommodation.

The GPC will consider the request, and may either reach a decision on the matter, or bring it up in the faculty meeting in which the student's work is discussed (see next part, under Final Result of the Preliminary Exam)

9) A student who has completed an MS thesis in our department will be considered to have completed the research component of the Prelims Exam. The final Pass/Fail decision for this student on the Prelims Exam will still be made in a faculty meeting as described in the section below.

Final Result of the Preliminary Examination:
1) After the end of each semester, there will be a faculty meeting to decide the final result of the Prelims Exam for each student who took the research component of the exam during that semester. The faculty decision will take into account the student's performance on both components of the Prelims Exam, namely the course component and the research component. The faculty will consider and discuss

a) the recommendations made by the student's research exam committee members on the research report and the oral exam,
b) the student's performance in all courses taken by the student including

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	the courses taken for the Prelims course component, and c) the support and willingness of a faculty member to advise the student for his/her PhD dissertation. The faculty will then vote and decide on which students failed and which students passed the Preliminary Exam. In some cases, a Conditional Pass may be given (see below). **2)** The result of the Preliminary Exam may have one of three outcomes: Pass, Conditional Pass, or Fail. If the result is a Conditional Pass, then the student is typically asked to revise the research report and/or re-take the Oral Exam within 4 weeks. In this case, the student's committee will issue fresh evaluations and recommendations on the report and oral exam, and these recommendations will be discussed in another faculty meeting. The faculty's decision on the retake will be either Pass or Fail. **3)** If the original outcome is a Fail, or if the result of the revised exam is a Fail, a recommendation to dismiss the student will be made to the Office of Graduate Studies. In most cases, the student's funding – if provided thus far by the department – will be discontinued. In rare situations, upon advocacy of an advisor who is willing to work with the student, a second chance for the prelims research project may be granted by the faculty. This advisor may be the same as the advisor for the first attempt or may be a different advisor.
Advanced PhD Requirements Students who have passed the preliminary exams should work with their advisor toward satisfying the next goals in the degree program.	**Advanced PhD Requirements** Students who have passed the preliminary exams should work with their advisor toward satisfying the next goals in the degree program.

Advisory Committee. Each candidate, with the advice of the PhD advisor, needs to establish an advisory committee (usually following the successful completion of the preliminary exam). In accordance with the University requirements, the committee consists of 4-6 members nominated and approved by the CIS Department faculty. The committee chair is the candidate's PhD advisor in charge of the candidate's research and dissertation and must be a member of the CIS faculty. The candidate may have a co-advisor who must be a UD faculty, possibly from another department. A co-advisor is a member of the advisory committee. At least two members represent the area of proposed research. The committee must also include at least one member of the CIS faculty working outside the main area of the proposed research. At least one member must be from outside the CIS Department. The proposed advisory committee must be submitted to the Graduate Committee for approval. It must then be approved by the CIS faculty. In the above, CIS faculty means tenure-track faculty whose primary appointment is in the CIS Department or who have a joint appointment in CIS, but not including continuing track faculty, research faculty, affiliated faculty, visiting faculty, secondary faculty, or adjunct faculty.	
Qualifying Examination. Each candidate must pass a qualifying exam. The advisory committee prepares an examination (oral and/or written) testing a candidate's knowledge in the area of proposed research. Part of the examination includes an oral presentation of a candidate's proposed dissertation research. A student passes the qualifying exam as long as there is no more than one negative vote.	

Prior to taking the qualifying exam, candidates must submit a dissertation proposal and a written plan describing their background and research interests. The proposal and plan are submitted to the advisory committee and are considered as input to the qualifying examination. Copies of "Discussion on PhD Thesis Proposals in Computing Science" are available in the CIS Department Office.

The qualifying exam is normally taken one year after passing the preliminary exam. During this year a student should actively investigate research possibilities and select a dissertation topic.

Dissertation. Each candidate must complete a dissertation demonstrating results of original and significant research written in a scholarly and competent manner worthy of publication. Upon completion of the dissertation, a final oral public examination must be passed, consisting of a defense of the dissertation and a test of the mastery of a candidate's research area. The final oral examination is directed and evaluated by the student's advisory committee.

Facility of Expression in English. As part of satisfying the University's requirement that PhD graduates demonstrate an ability to orally express themselves clearly and forcefully, each candidate must present his or her research results in a departmental colloquium, or one of the Department's special research interest groups within six months of the defense. There is no foreign language requirement for the degree.

Note Graduate students who both (1) were or are admitted before the catalog with the new policy is published, and (2) have not yet passed the old Preliminary Exams, may choose whether to fulfill the old

requirements or the new. Students admitted after the publication of the new catalog must follow the new requirements.

FINANCIAL AID A number of fellowships, research assistantships and teaching assistantships are awarded each year to full-time graduate students in the Department. Additionally, a few fellowships are awarded by the University to particularly outstanding students. Both entering and continuing graduate students are eligible to apply for financial aid.

Admission to the graduate program does not automatically entitle an applicant to financial aid. Aid is awarded on a competitive basis from the pool of admitted applicants. Usually awards are made in March-May for the fall semester, and in December for the spring semester.

If awarded financial aid and if satisfactory academic progress is maintained along with satisfactory performance of assistantship duties (when applicable), students entering with a bachelor's degree are normally supported up to two years for the MS degree, or up to five years for the PhD degree. Students entering with a master's degree are normally supported up to three years.

We note that the department makes no commitment to funding all students. Those students who are funded are generally either on RAs or TAs:

- The RAs are typically funded from grant/contract funds managed by individual faculty. Those individual faculty make the decisions about the student responsibilities, funding level, funding period and evaluation. Students are expected to work 20 hours per week on a Fall or Spring RA, and up to full

time on a Winter or Summer RA. As a general rule faculty make every effort to fund students until they have graduated assuming satisfactory progress. Most often students are funded one year at a time and almost always at or above the level for CIS TA funding.

- The TAs are funded out of the CIS Department operating budget. The decisions about which students to fund are made by the Chair's office in consultation with the Graduate Admissions and/or Graduate Program Committee Chairs. Most often students are provided with two years of initial TA funding dependent on satisfactory TA performance and adequate progress in their courses and/or in passing the PhD preliminary exam. As a general rule the department is committed to providing a total of up to five years of funding for PhD students who make adequate progress (including clearing the PhD preliminary exam and the PhD qualifying exam requirements in a timely fashion). TAs are evaluated each semester by the faculty member for whom they are TAing. The Department Chair and/or Associate Chair review these evaluations. Responsibilities vary with the supervising instructor, but include some combination of grading, office hours, attending class, and conducting lab sessions. The funding level has typically been slightly above the minimum university funding level for TAs.