**Regulations for Doctoral Students in Mathematics**

A supplement to the regulations in the Graduate School *Bulletin of Information*

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### New Students

A new graduate student should plan to arrive at Notre Dame well before registration. There are orientation events hosted by the Graduate School, and there may be departmental orientation events as well. The student will be assigned a first-year adviser. The student should talk with the Director of Graduate Studies (DGS), with the first-year adviser, and with other faculty members, to get acquainted in the department and to decide on appropriate first-year courses.

### Course Requirements

In the first year, a student normally registers for four courses per semester. Four basic courses is a common load, but students are permitted and encouraged to “place out” of basic courses if they arrive with an adequate knowledge of the material (the procedure for doing this is described later). A first-year student not taking four basic courses is expected to take topics courses and/or readings courses to bring the course load to four. Occasionally, there is reason for a student to take a different number of courses, but this needs the approval of the adviser and the DGS.

#### Basic Courses

- 60210, 60220  Algebra I, II
- 60350, 60360  Real Analysis I, II
- 60370, 60380  Complex Analysis I, II
- 60330  Basic Geometry and Topology
- 60440  Basic Topology
- 60510, 60520  Logic I, II
- 60610  Discrete Mathematics
- 60620  Optimization
- 60650  Basic PDE
- 60670  Basic Differential Geometry
- 60850  Probability

The first several of these courses are offered every year in the Mathematics Department. Basic PDE and Probability may be offered by the Mathematics Department or the ACMS Department. Further basic courses, in particular Numerical Analysis, are offered regularly by ACMS.
The basic courses provide essential background for later work. Basic courses do not have prerequisites, except that for certain two-semester sequences such as Algebra, Algebra I is the prerequisite for Algebra II. Basic courses all have regular homework and comprehensive examinations.

At the end of these regulations is a syllabus for each of the basic courses, together with references covering this material.

Further courses in Mathematics
Introduction to Algebraic Geometry (60710) is basic in the sense that it introduces the subject area. However, it might be better taken in the second year, after some basic courses. A very brief description is given after the syllabi for the other basic courses.

The other courses in the department are directed readings courses (56xxx and 86xxx), topics courses, and Intermediate Geometry and Topology (70330). These do not have fixed syllabi—the same course number is used for courses covering very different material in different years.

A first-year student may be able to place out of one or more basic courses. To do so, the student must convince the faculty member teaching the basic course that he or she has mastered the material on the syllabus. A student who places out of a basic course substitutes a readings course or a topics course. Thus, by placing out of one or more basic courses, the student may be able to accelerate the process of beginning research.

A first-year student should select basic courses carefully, with the help of the adviser and other faculty members. A student who is undecided about a research area, or is trying to choose among several areas, must choose courses with special care, to keep open all of the options.

To be full-time in the Graduate School, a student must be registered for at least 9 credits. Above, there is a description of the usual schedule for the first year student, and below there is a description of what happens in the second year and after.

The selection of an area of specialization normally occurs by the end of the first year or the beginning of the second year. Students should explore possible areas of research as soon as possible, by taking topics and readings courses, attending departmental colloquia and seminars, and talking with various faculty members.

In the second year, a student normally registers for three courses per semester. These may be a combination of basic and topics courses. A student who has not yet passed the oral candidacy examination may register for a 3-credit readings course with a possible adviser.

After the second year, a student may be full-time by registering for 9 credits of research and dissertation. However, most students should continue to register for interesting or important courses through the full time of study at Notre Dame.

A student's schedule must always have the approval of the adviser, and anything unusual must also be approved by the DGS.

Course requirements are summarized as follows.

1. A student must, by the end of the second year, complete or place out of at least 6 basic courses, approved by the adviser. For many students, 8 or 10 basic courses may be the right number.

2. A student must accumulate at least 36 credits in basic and topics courses (or possibly, directed readings) during the first three years at Notre Dame. There is no transfer of credits. Fourth and fifth year students should continue to register for topics courses, as appropriate. The Graduate School requires at least 60 credits for graduation (this includes the above plus credits from the research and dissertation course).

3. Maintain an average G.P.A. of at least B (3.0). This is a condition for being in good academic standing.

4. All students are expected to attend departmental colloquia. Students are also expected to participate in seminars related to their mathematical interests.

Advisers
A new student has an initial adviser assigned by the DGS. As soon as feasible, the student should be working with a permanent adviser/thesis director. Sometimes the initial adviser ends up as the thesis director, but often there is a change in adviser. Well before the oral candidacy examination, the student needs an adviser who has agreed at least to supervise the student’s preparation for this examination.

To change advisers, the student needs the consent of the new adviser. In addition, the student should inform the DGS and, as a courtesy, the former adviser.

After passing the oral candidacy examination, a student may wish to change area as well as adviser. There is no problem in doing this so long as the student has taken the appropriate courses and has the consent of the new adviser. The student need not re-take the candidacy examinations.

The student should always feel free to come to the adviser, or the DGS, to talk about various aspects of academic life.
Candidacy Examinations

The candidacy examination has two components: written and oral.

Written Candidacy Examination

Each student must pass two written examinations, one in Algebra, and the other in either Real or Complex Analysis. Each examination covers the syllabus in the first semester of the basic course sequence: The algebra exam covers material from Algebra I, the real analysis exam covers material from Real Analysis I, and the complex analysis exam covers material from Complex Analysis.

The written candidacy examinations are offered shortly before the beginning of the fall and spring semesters, and at the beginning of the summer. A student who fails the candidacy examination on a given course may re-take it (more than once), or may take an examination on a different allowable course. The written candidacy examinations must be completed by the beginning of the second year.

A student may take a written candidacy examination without taking the corresponding course. Placing out of the course does not count as passing the written candidacy examination.

Oral Candidacy Examination

The oral candidacy examination, taken after the written candidacy examinations are completed, focuses on an “advanced” topic. This may be related to a topics course or seminar, or it may come from advanced research texts or articles. In any case, the student should begin working on the advanced topic, with an advisor, well in advance of the examination. The material to be counted as the advanced topic must have the approval of the adviser and the DGS.

The board of examiners for the oral candidacy examination consists of four examiners from the Mathematics Department. The members of the examining board are selected by the DGS (based on suggestions of the student and adviser). Normally, the adviser is one of the examiners.

The topic for the oral candidacy examination should be chosen months before the examination. The syllabus for the oral candidacy examination must be made available to all members of the examining board at the time they agree to serve. All examiners should restrict their questions to the advanced topic or other material on the given syllabus. Thus, the syllabus should provide guidance to the examiners.

The oral candidacy examination begins with a presentation by the student lasting between 30 and 50 minutes (the time should be set by the adviser within this interval). This is followed by questions on material from a syllabus related to the presentation. The examination lasts from one and a half to two hours. After the completion of the examination, the four examiners vote “pass” or “fail.” A vote of “pass” means that, in the eyes of the particular examiner, the student has passed all parts of the examination. The student is considered to have passed the oral candidacy examination only if at least three of the four examiners vote “pass”. In case the student does not pass, the examiners vote whether to recommend the student for a master’s degree. The student is informed of the outcome of the examination immediately.

The oral candidacy examination is usually held in early September, late November, late January, and/or April. Students are encouraged to take the examination as early as possible. In general, students must take the oral candidacy examination by the end of January in the second year. Exceptions may be made, with the permission of the DGS, for special circumstances. Students who fail the first time may take the examination again, but must in general do so no later than April of the second year. Again, exceptions may be made, with the permission of the DGS.

In the Mathematics Department, there is no requirement for a “doctoral dissertation proposal.” The material for the advanced topic may include specific research problems and partial results, but in most cases, the candidacy examination comes at a time when the student can only propose to work in a certain area.

The Thesis

Thesis research, under the supervision of the thesis director, normally begins after the successful completion of the candidacy examinations. The thesis director is expected to be concerned with the interest and significance of a thesis topic, with the originality of the research, and with the accuracy and the style of the manuscript. The final draft of the thesis should provide enough background and detail to make for easy reading by a semi-expert in the area, but should also be in a form that can easily be edited and shortened for publication, so that it would be suitable for publication in a good mathematics journal.

After the thesis director has approved the thesis, it is submitted to three official readers. Normally, these are professors in the Mathematics Department at Notre Dame.
(Sometimes, however, experts from other universities serve.) The DGS must approve the choices, and the Graduate School must as well. After all three official readers have approved the thesis, the thesis defense can be scheduled. In approving the thesis, the official readers certify that it is worthy of defense. They may continue to require changes.

**Thesis Defense**

The thesis defense is an oral examination on the contents of the thesis and its relation to other work in the same area. The board of examiners for the thesis defense normally consists of four examiners, where these are the thesis director and the three official readers. Sometimes, there are two advisors.

The examination begins with a 30-50 minute presentation by the Ph.D. candidate, prepared in consultation with the thesis director (who also sets the length). A round of questions follows this by the examiners. There may be questions about specific points in the thesis, and also about the importance of the research and what further work it suggests. A thesis defense is public, in the sense that people other than the candidate and the members of the board of examiners may be present for the lecture. Such people leave the room prior to the vote. Voting is as for the oral candidacy examination. As for the oral candidacy examination, the candidate is informed of the outcome immediately.

After a successful defense, the candidate may still need to make minor changes in the thesis. Then the final version of the thesis, signed by the thesis director, is submitted to the Graduate School.

Getting the thesis read and approved, scheduling the thesis defense, making corrections, and having the thesis accepted by the Graduate School is a time-consuming process that requires strict adherence to the timetables set by the Department of Mathematics and the Graduate School. The thesis must be submitted to the readers well before the Graduate School deadline for submission of theses. The latter is roughly two months before the graduation date. August graduation entails special difficulties, since there are fewer faculty members available during the summer to serve as official readers.

There are strict rules about formatting, margins, etc., which must be observed if the thesis is to be accepted by the Graduate School. The Ph.D. candidate should be sure to consult the Graduate School’s Guide for Formatting and Submitting Doctoral Dissertations and Master’s Theses (available on the Graduate School’s website at http://graduateschool.nd.edu/resources-for-current-students/dt/). This document changes from year to year, so it is important to consult the current version and other students who have recently written theses.

**Summary of Official Requirements for the Ph.D. Degree**

1. Courses and credits—appropriate basic courses, 36 credits in basic and topics courses, plus further credits of research and dissertation to make a total of 60 credits.

2. Residency—4 consecutive semesters of full-time study (as required by the Graduate School). The term ‘full-time’ means that the student is registered for at least 9 credits, and that the schedule is approved by the adviser.

3. Written and oral candidacy examinations

4. Admission to Degree Candidacy (see the Graduate School Bulletin of Information)

5. Thesis carried through the following steps:
   a. approved by the adviser and all three readers
   b. prepared for electronic submission
   c. signed by adviser
   d. accepted by the Graduate School

6. Thesis Defense (this cannot be officially scheduled until steps 1-4 and 5a are completed).

**Student Status**

The Mathematics Department does not admit students who plan to study on a part-time basis.

A student is considered to be full-time if he or she is registered for at least 9 credits and the adviser certifies that the student is working full-time. At first, the work is almost entirely tied to courses. Later, the thesis is the main focus. In some cases, the student may simply register for 9 credits of research and dissertation.

To be in good academic standing, a student must maintain a G.P.A. of at least 3.0 and be on schedule in terms of course work and examinations. In addition, once the student is no longer registered for basic courses, the adviser must indicate that the student is making satisfactory progress. Thus, it is essential for the student to keep the adviser informed about his or her progress. Normally, a student who is not registered for basic courses is registered for research and dissertation with an adviser, and the adviser indicates that the student is making satisfactory progress by giving a grade of at least B in this course.

A student who does not succeed in passing the first year courses is not permitted to continue in the second year. A student who does not pass the candidacy examinations by the end of the second year is not permitted to continue in the third year. A student who, for two consecutive semesters, fails to maintain good academic standing (as described above) is not permitted to continue further.
A student must fulfill all doctoral requirements, including the dissertation and its defense, within eight years from the time of matriculation. Failure to complete any of the Graduate School or departmental requirements within the prescribed period results in forfeiture of degree eligibility. A student is normally expected to finish within five years.

The M.S. Degree

The graduate program in the Mathematics Department is almost entirely a Ph.D. program. Students are not normally admitted directly to a Master's program. There is a Master of Science degree in Applied Mathematics, for students who do not need funding and wish to pursue an interdisciplinary project, or to carry out serious mathematical work while pursuing a Ph.D. in another department. (The requirements for the MSAM are available through the DGS.)

A student who is working toward a Ph.D. in Mathematics may qualify for a Master of Science degree along the way, if he or she has accumulated 30 credit hours, has passed the written candidacy examination, and has either passed the oral candidacy examination or (without passing) exhibited sufficient knowledge to obtain a positive recommendation from the examiners. Having met the requirements, a student must also ask to have his or her name put on the graduation list. The Master of Science degree is not given automatically.

Financial Support

Continued financial support requires the student to maintain good academic standing, and to carry out in a conscientious way any teaching duties associated with the support. The Mathematics Department does not provide financial support beyond the fifth year. Neither teaching assistants nor fellowship holders are allowed to take outside employment without special approval.

(Occasionally, students are permitted to tutor up to four hours per week, with the permission of the adviser and the Department Chair.)

Decisions about financial support are made at the end of the spring semester for the next academic year. Students are informed about support at that time.

Teaching Opportunities

First year students have no teaching duties. Second and third year students are typically assigned to conduct tutorial. After gaining some experience with the tutorial sessions, students are assigned to teach a course—usually one section of a multi-section introductory course, under the supervision of a senior faculty member.

The Director of Graduate Studies

The DGS has direct responsibility in the following areas:

1. Providing information about the program to prospective and current graduate students
2. Assigning initial advisers, and overseeing course placement
3. Selecting examiners for oral candidacy examinations (for approval by the Graduate School)
4. Overseeing the scheduling of thesis defenses.

The department’s Associate Chair makes teaching assignments.

The Department Chair and the DGS, in consultation with the adviser, when appropriate, make recommendations for fellowships and stipends.

Syllabi for Basic Courses

The syllabi for the basic courses are given below, with references for each subject.

Algebra I, II

The examinable material for the graduate algebra candidacy exam is 1 through the first part of 3 below (up to but not including categories), though Algebra I will usually cover more than this. Topics labeled *, and perhaps additional topics not mentioned, may be covered at the discretion of the instructor.

1. Groups
   Groups. Cyclic groups, permutation groups, symmetric and alternating groups, matrix groups. Subgroups, quotient groups, direct products, homomorphism theorems. Automorphisms, conjugacy. Cosets, Lagrange's theorem. Group actions, G-sets, Sylow theorems, free groups and presentations.

2. Rings

3. Modules
4. Canonical forms of matrices of linear transformations
   Jordan, rational and primary rational canonical forms. Invariant factors and elementary divisors.
5. Fields
   Fields, algebraic and transcendental field extensions, degree, transcendence degree, algebraic closure.
   Fundamental theorem of Galois theory, separability, normality. Finite fields. *Cyclotomic extensions,
   *cyclic extensions, *solvable and nilpotent groups, *Impossibility proofs (trisecting angles, etc), *solvability of polynomial equations by radicals
6. Tensor products
   Tensor products, *algebras, *(the tensor, symmetric and exterior algebras)
7. Chain conditions
   Artinian and Noetherian rings and modules, Hilbert basis theorem. *Simple and semisimple modules.
8. Commutative algebra
   and commutative rings.

References
T. Hungerford, *Algebra, Graduate Texts in Mathematics* 73.
N. Jacobson, *Basic algebra I, II*. S. Lang, *Algebra*

**Real Analysis I, II**

1. Calculus
   Calculus of one and several variables, the Implicit and Inverse Function Theorems, pointwise and uniform convergence of sequences of functions, integration and differentiation of sequences, the Weierstrass Approximation Theorem.
2. Lebesgue measure and integration on the real line
   Measurable sets, Lebesgue measure, measurable functions, the Lebesgue integral and its relation to the Riemann integral, convergence theorems, functions of bounded variation, absolute continuity and differentiation of integrals.
3. General measure and integration theory
   Measure spaces, measurable functions, integration convergence theorems, signed measures, the Radon-Nikodým Theorem, product measures, Fubini’s Theorem, Tonelli’s Theorem.
4. Families of functions
   Equicontinuous families and the Arzela-Ascoli Theorem, the Stone-Weierstrass Theorem.
5. Banach spaces
   $L^p$ spaces and their conjugates, the Riesz-Fisher Theorem, the Riesz Representation Theorem for bounded linear functionals on $L^p$, $C(X)$, the Riesz Representation Theorem for $C(X)$, the Hahn-Banach Theorem, the Closed Graph and Open Mapping Theorems, the Principle of Uniform Boundedness, Alaoglu’s Theorem, Hilbert spaces, orthogonal systems, Fourier series, Bessel’s inequality, Parseval’s formula, convolutions, Fourier transform, distributions, Sobolev spaces.

References
Apostol, *Mathematical Analysis*.
Knapp, *Basic Real Analysis*.
Riesz-Nagy, *Functional Analysis*.
Royden, *Real Analysis*.
Rudin, *Principles of Mathematical Analysis*.
Rudin, *Real and Complex Analysis*.
Rudin, *Functional Analysis*.
Simmons, *Introduction to Topology and Modern Analysis*.
Wheeden-Zygmund, *Measure and Integration*.
Folland, *Real Analysis*.

Real Analysis I covers the material on calculus, and Lebesgue measure and integration. It is roughly Chapters I-III and V-VI of Knapp. The remaining material is in Real Analysis II.

**Complex Analysis I, II**


References
Ahlfors, *Complex Analysis*. 
Burchel, An Introduction to Classical Complex Analysis I.
Conway, Functions of One Complex Variable.
Forster, Lectures on Riemann Surfaces.
Gunning, Lectures on Riemann Surfaces.

Complex Analysis I covers approximately Chapters 1-6 of Ahlfors. Complex Analysis II covers the remaining material.

Basic Geometry and Topology (Fall Semester)
2. Basic algebraic topology: fundamental group, covering spaces, the van Kampen Theorem, the fundamental group of a surface.
3. Smooth manifolds: tangent bundle and cotangent bundle, vector bundles, constructions with vector bundles (sums, products symmetric and exterior powers), sections of vector bundles, differential forms, the de Rham complex, inverse and implicit function theorems, transversality.

References
Munkres, Topology.
Hatcher, Algebraic Topology (Chapter 1).
Lee, Introduction to Smooth Manifolds.

Basic Algebraic Topology (Spring Semester)
1. Homology: singular homology, the Eilenberg-Steenrod axioms, homology group of spheres, the degree of a map between spheres, homology calculations via CW complexes, proof of homotopy invariance, proof of excision, universal coefficient and Künneth Theorem.
2. Cohomology: the cup product, the cohomology ring of projective spaces.
3. Poincare duality.

Reference
Hatcher, Algebraic Topology (Chapters 2 and 3).

Basic Differential Geometry (Spring Semester)
2. Riemannian geometry: Levi-Civita connection, exponential map, Jacobi fields, arc length variation formulas, fundamental equations for metric immersions and submersions, space forms, Hopf-Rinow, Hadamard-Cartan, Bonnet-Myers (Gauss-Bonnet, Bochner technique).
3. Other geometric structures: (one or more of Kahler manifolds, symplectic manifolds, contact manifolds).

References
Chavel, Riemannian Geometry: A modern introduction.
Grove, Riemannian geometry: A metric entrance.
Petersen, Riemannian Geometry.
Gallot, Hulin, and Lafontaine, Riemannian geometry.
Cullen, Introduction to General Topology.
Dugundji, Topology.
Steen, Counterexamples in Topology.

Algebraic Topology
1. The fundamental group Covering spaces, VanKampen’s Theorem and calculation of fundamental groups of surfaces.
2. Homology
Singular homology and cohomology theory.
3. Homotopy
Exact homotopy sequence of a pair. Hurewicz’ Theorem.
4. Manifolds
The Poincaré Duality Theorem.

References
J. Vick, Homology Theory.
G. Whitehead, Homotopy Theory.
E. Spanier, Algebraic Topology.
A. Dold, Lectures on Algebraic Topology.
C. Maunder, Algebraic Topology.
A. Hatcher, Algebraic Topology.

Topology I covers the material on general topology, plus the first part of algebraic topology - the fundamental group, covering spaces, and VanKampen's Theorem (found in Chapter 1 of Hatcher). The remaining material is in Topology II.
Logic I, II

1. Model Theory

References
Chang and Keisler, Model Theory.
Sacks, Saturated Model Theory.
Poizat, Cours de Théorie des Modèles.

2. Computability Theory

References
R. I. Soare, Recursively Enumerable Sets and Degrees.
N. Cutland, Computability.
H. Enderton, A Mathematical Introduction to Logic.

3. Set Theory

References
T. Jech, Set Theory.
K. Kunen, Set Theory.
P. Cohen, Set Theory and the Continuum Hypothesis.

Logic I covers either all of the material on model theory and the material on computability through Myhill's Theorem, or else all of the material on computability and the material on model theory through the Compactness Theorem. Logic II covers the remaining material.

Discrete Mathematics

1. Graph theory: trees and graphs, Eulerian and Hamiltonian graphs, tournaments, graph coloring and Ramsey’s theorem. Applications to electrical networks.

2. Enumerative combinatorics: inclusion-exclusion principle, generating functions, Catalan numbers, tableaux, linear recurrences and rational generating functions, and Polya theory.

3. Partially ordered sets: distributive lattices, Dilworth’s theorem, Zeta polynomials, Eulerian posets.

4. Projective and combinatorial geometries, designs and matroids.

References
J.H. van Lint and R. M. Wilson, A Course in Combinatorics, 2nd ed.

Optimization

References
Barvinok, A Course in Convexity.
R. Webster, Convexity.

Basic PDE

Reference
L. Evans, Partial Differential Equations.

Linear Control
Introduction to linear system theory. Linear-quadratic control, $H$-infinity control, introduction to robust control based on matrix cube theorem, linear matrix inequalities and interior-point algorithms.

References
A. Ben-Tal and A. Nemirovski, Lectures on Modern Convex Optimization.
P. Lancaster and L. Rodman, Algebraic Riccati Equations.
S. Boyd et. al. Linear Matrix Inequalities in System and Control Theory.
Probability

1. Elements of measure and integration theory.
2. Basic setup of probability theory (including sample spaces, conditional probability, independence). Random variables, the "law of large numbers."
3. Discrete random variables (including random walks).
4. Continuous random variables, the basic distributions, sums of random variables.
5. Generating functions, branching processes, basic theory of characteristic functions, central limit theorems.
7. Monte Carlo simulations.
8. More "laws of large numbers." including the law of the iterated logarithm, Martingales, filtered sigma algebras, and the simplest martingale convergence theorems.
9. Various stochastic processes, including Brownian motion, queues, and applications.
10. Martingales, including stopping times and optimal stopping.
11. The rudiments of stochastic integration (including Ito's formula and the Black-Scholes differential equation).

References

D. Williams, Probability and Martingales.

Introduction to Algebraic Geometry (two-semester course sequence).

This is an introduction to algebraic varieties, schemes, coherent sheaves, curves, and surfaces.

Grievance Procedure

If a mathematics graduate student has a grievance, the procedure is to go first to the DGS, unless the grievance involves the DGS, in which case, the student should approach the Department Chair. The DGS, or the Department Chair, will try to work with the parties involved to reach a solution. If this is not sufficient, the Department Chair will appoint an ad hoc committee of faculty members and students (not directly involved) to hear a particular case. If the student feels that this is not enough, then he or she may appeal to the Graduate School. The Graduate School Policies and Grievance and Appeal Procedures can be found in the Graduate School Bulletin of Information or on their website at http://graduateschool.nd.edu/resources-for-current-students/.

Departmental Appeal of Dismissal

A graduate student who fails to meet the requirements involving coursework (36 credit hours in basic and topics courses in first three years with 3.0 GPA) and exams (written exams passed by beginning of second year, oral exam passed by end of second year) may be automatically dismissed from the program. There are further grounds for dismissal, which are more subjective—failure to make adequate progress in research, failure to work with the adviser toward the thesis document, failure to perform TA duties properly. Before a student is dismissed for these more subjective grounds, he/she will receive a warning letter from the DGS, with specific steps that need to be carried out by a specified time. At the end of this time, the Graduate Studies Committee will determine whether the steps have been carried out. If the decision is negative, then the student is dismissed. There are very limited grounds for appealing dismissal. The student must show that the decision resulted not from his/her failure to meet expectations, but from personal bias or improper procedures. Since the decision to dismiss involves the DGS, an appeal, if any, starts with the Chair, who will appoint an ad hoc committee, if appropriate. A further appeal to the Graduate School is possible, under very limited conditions. See the Graduate School Bulletin of Information.

Graduate Bulletin

Mathematics students are included in all of the general policies and rules of the Graduate School, as given in The Graduate Bulletin of Information (http://graduateschool.nd.edu/resources-for-current-students/).