Graduate Degree Programs in Mathematics

2016-17
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I. GRADUATE DEGREE PROGRAMS IN MATHEMATICS

The Mathematics Department at UC Santa Cruz offers programs leading to the M.A. and Ph.D. degree.

M.A. Degree Requirements
Students are required to complete two of courses 200, 201, 202; two of courses 204, 205, 206; one of courses 208, 209, 210, and complete five additional courses in mathematics (or related subject, by approval). In addition, students must do one of the following:

- Pass an M.A. level preliminary examination
- Write a Master’s thesis

Ph.D. Degree Requirements
Students are required to complete all of the following:

- Obtain a first-level pass on at least one of the three written preliminary examinations, and a second-level pass on at least one other. Students must complete the full sequence in the track associated with the preliminary examination on which they did not achieve a first-level pass
- Satisfy the foreign language requirement
- Pass the oral qualifying examination
- Complete three quarters as a Teaching Assistant (TA)
- Complete six graduate courses in mathematics other than 200, 201, 202, 204, 205, 206, 208, 209 and 210. No more than three courses may be independent study or thesis research courses.
- Write a Ph.D. thesis

Students admitted to the Ph.D. program may receive an M.A. degree en route to the Ph.D.

Students admitted to the M.A. program may transfer to the Ph.D. program upon passing the required preliminary examinations at the Ph.D. level.
ADVISING

Entering graduate students are initially advised by the Graduate Vice Chair, then assigned a faculty mentor who will serve as an ongoing advising resource for the student. Within the first two years (and typically after passing the preliminary examinations), the student will select a faculty advisor in the area of the student’s research interest; this is done in consultation with the Graduate Vice Chair. Each graduate student is expected to consult with their advisor to formulate a research plan. Ultimately, the student’s advisor will become the student’s thesis advisor.

For both M.A. and Ph.D. students, progress is regularly assessed via student meetings with mentors and advisors. In spring quarter, all students will be scheduled for an annual progress review with the Graduate Vice Chair and the Graduate Program Coordinator. At the end of spring quarter, a progress letter for each graduate student is issued, including both target and completion dates for the degree. At this time, each student is determined to be making either satisfactory or unsatisfactory progress.

PRELIMINARY EXAMINATIONS AND BASIC GRADUATE SEQUENCES

A three-course sequence in each of the three fields of algebra, analysis and geometry-topology will be offered each year. Preliminary examinations (prelims) will be given for each sequence at the beginning, middle and end of each academic year. In the event that only one student arrives at the exam room to take a preliminary exam, that student may choose to take the exam at that time or opt to take the exam with another topic group (if schedule allows).

II. TOPICS AND REFERENCES FOR PRELIMINARY EXAMINATIONS

Topics for the Algebra Preliminary Examination

a. Linear Algebra
1. Matrices, determinants, vector spaces, subspaces, bases, dimensions
2. Linear maps, isomorphisms, kernel, image, rank
3. Characteristic polynomial, eigenvalues, eigenvectors
4. Vector spaces with symmetric and alternating inner products
5. Matrix representations of linear maps and inner products
6. Normal forms for symmetric, hermetian, and general linear maps, diagonalization
7. Orthogonal, unitary, hermitian matrices
8. Multi-linear algebra: tensor products, exteriors, and symmetric algebras

b. Group Theory
1. Groups, subgroups, cosets, Lagrange’s theorem, the homomorphism theorems, quotient groups
2. Permutation groups, alternating groups, matrix groups, dihedral groups, quaternion groups
3. Free groups, groups described by generators and relations, free abelian groups
4. Automorphisms, direct and semidirect products
5. P-groups, the class equation, applications
6. Group actions on a set, Sylow theorems
7. Nilpotent and solvable groups, simple groups

c. Ring and Module Theory
1. Ideals, integral domains, quotients rings, polynomial rings, matrix rings
2. Euclidian domains, principal ideal domains, unique factorization
3. Chinese Remainder Theorem, prime ideals, localization
4. Modules over a PID, applications to a normal form
5. Free modules, short exact sequences

d. Field Theory
1. Algebraic and transcendental extensions, normal extensions, separability
2. Finite algebraic extensions, splitting fields, Galois theory, perfect fields
3. Finite field
4. Cyclotomic polynomials, cyclotomic extensions of the rationals and of finite fields


Topics for the Analysis Preliminary Examination

a. Basic Analysis
   1. Sequences and series functions, uniform convergence, Fourier series
   2. Differentiation and integration of real and complex valued functions
   3. Functions of bounded variation, the Riemann-Stieltjes integral
   4. The implicit function theorem, the inverse function theorem

b. General Topology
   1. Open and closed sets, topological spaces, bases, Hausdorff spaces
   2. Continuous functions, the product topology, Tychonoff theorem
   3. Locally compact spaces, Urysohn’s lemma, partition of unity
   4. Nowhere dense sets, sets of the first category, Baire category theorem

c. Metric Spaces
   1. Distance function, metric spaces
   2. Convergence, Cauchy sequences, completeness
   3. The contraction-mapping theorem
   4. Continuous functions on metric spaces
   5. Arzela-Ascoli theorem and applications

d. Measure and Integration
   1. Lebesgue measure, Borel sets, measurable sets, additivity
   2. Abstract measure, o-algebra, construction of measure, Caratheodory criterion
   3. Measurable functions, Egorov theorem
   4. Pointwise convergence, uniform convergence, Vitali-Lusin theorem
   5. Lebesgue integration, monotone convergence theorem, Fatou lemma
   6. Lebesgue dominated convergence theorem, convergence in measure
7. Relations between different notions of convergence
8. Product measure, complete measure, Fubini theorem
9. $L^p$ spaces, Hölder and Minkowski inequalities, Chebyshev’s inequality
10. Radon-Nikodym theorem, Lebesgue theorem

e. **Complex Analysis**
   1. Analytic functions, Cauchy-Riemann equations
   2. Cauchy integral theorem, Cauchy integral formula
   3. Singularities, poles, the theory of residues, evaluation of integrals
   4. Maximum modulus theorem
   5. Argument principle and Rouche’s theorem
   6. Linear fractional transformation

f. **Functional Analysis**
   1. Normal linear space, Banach space
   2. Linear functional, linear operator, continuity and boundedness
   3. Hahn-Banach theorem
   4. Uniform boundedness theorem
   5. Open mapping and closed graph theorems
   6. Weak and weak* topology, reflexive space, Banach-Alaoglu theorem
   7. Inner product, Hilbert space, orthonormal bases, Riesz representation theorem
   8. Self-adjoint operators, compact operators, and their spectrum
   9. Fredholm alternative property, Fredholm operators
   10. Fourier transform, rapidly decreasing functions, Fourier transform on $L^2$

Topics for the Geometry-Topology Preliminary Examinations

a. Manifolds and Tangent Bundles
   1. Examples of manifolds, orientation
   2. Inverse function theorem and implicit function theorem, immersion, submersion
   3. Partition of unity, embeddings, Whitney embedding theorem
   4. Sard’s theorem
   5. Tangent vectors, tangent bundle, push-forward
   6. ODE on manifolds, existence and uniqueness theory
   7. Flows, Lie bracket, Forbenius’ theorem
   8. Riemannian metrics, examples
   9. Basic Lie groups

b. Differential Forms and Integration on Manifolds
   1. Cotangent bundle, exterior differentiation, contraction, Lie derivative, de Rham differential, Cartan formula
   2. Integration on manifolds, Stokes’ theorem
   3. De Rham cohomology, de Rham theorem, examples
   4. More applications of Stokes’ theorem, degree and winding number
   5. Frobenius’ theorem, foliations, non-integrable distributions

c. Fundamental Group and Covering Space
   1. Fundamental group, calculations, Van Kampen theorem
   2. Covering spaces, properties, classification of covering spaces

d. (Co)homology
   1. simplicial and CW complexes, examples
   2. Singular (co)homology, properties, calculations, exact sequences for singular (co)homology
   3. Betti numbers, Euler number
   4. Eilenberg-Steenrod axioms for homology
   5. Mayers-Vietoris sequences
6. Cup and cap products, and Poincare duality for manifolds
7. Degree, Euler characteristics, applications
8. Lefschetz fixed point theorem and applications


III. DEGREE PROGRAMS AND TIMETABLE

Students enrolled in the M.A. program are expected to meet the requirements of the degree within two years. Enrollment beyond this time requires the approval of the Graduate Vice Chair. Students enrolled in the M.A. program who wish to transfer to the Ph.D. program will be allowed to do so if they have passed the preliminary examinations in accordance with the Ph.D. examination requirements. Students in the Ph.D. program typically receive an M.A. degree in the course of their studies.

Students enrolled in the Ph.D. program are expected to meet the timetable below, which leads to a Ph.D. in four to six years. Enrollment in the Ph.D. program beyond six years requires the approval of the Graduate Vice Chair.

DEGREE TIMETABLE

<table>
<thead>
<tr>
<th>Degree</th>
<th>Requirement</th>
<th>Targeted Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters</td>
<td>Completion</td>
<td>2 years</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>Preliminary Exams</td>
<td>2 years</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>Language Exam</td>
<td>End of third year</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>Oral Qualifying Exam</td>
<td>By 7th quarter but no later than 12th quarter</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>Dissertation</td>
<td>4 to 6 years</td>
</tr>
</tbody>
</table>

Preliminary exams (Ph.D. and Master’s students): Ph.D. students should complete their preliminary exams and introductory sequence requirements by the end of their 2nd year to make satisfactory progress. Master’s students should complete the preliminary exam and course requirement by the end of their 2nd year. If a graduate student does not
fulfill the above requirement by the end of their 2nd year, they may be placed on academic probation depending on their progress. If a graduate student has not fulfilled the above requirements by the end of the 3rd year, they may be subject to dismissal from the program.

**Advancing to Candidacy (Ph.D. students):** To make satisfactory progress, Ph.D. students should advance to candidacy by the end of their fourth year. A Ph.D. student who has not advanced to candidacy by the end of the 4th year may be placed on academic probation or dismissed from the program.

**Dissertation (Ph.D. students):** Ph.D. students are expected to obtain their Ph.D. degree in 4 to 6 years.

**IV. FOREIGN LANGUAGE REQUIREMENT**

Graduate students in the Ph.D. program are required to demonstrate knowledge of French, German or Russian sufficient to read the mathematical literature in the language. Any member of the Mathematics faculty may administer a foreign language examination, which can be oral or written. The foreign language requirement must be satisfied before taking the qualifying examination for advancement to candidacy for the Ph.D. degree.

**V. QUALIFYING EXAMINATION FOR ADVANCEMENT TO CANDIDACY**

All graduate students in the Ph.D. program are required to take the Oral Qualifying Examination for advancement to candidacy for the Ph.D. degree. Students typically complete this examination between their seventh and twelfth quarter in residence to demonstrate sufficient understanding of their Ph.D. thesis problem. Any student who has not passed their oral exam by the end of their fourth year will be subject to academic probation or dismissal from the program. The examining committee consists of the student’s faculty advisor, at least two other Mathematics faculty members, and at least one faculty member from another discipline. The student, the student’s faculty
advisor, and the Graduate Vice chair will select the committee; the chair of the committee must be someone other than the student’s faculty advisor. The Graduate Division must approve the committee. The committee decides on the topics included in the examination, which should be broad enough to encompass a substantial body of knowledge in the student’s area of interest. The student is to prepare a written list of topics to be included in the examination, along with a short bibliography. A copy will be given to each committee member. An additional copy will be filed into the student’s permanent records. If the student fails the examination, a re-examination can be given within the next three months. Usually, the membership of the examining committee remains fixed.

VI. THE DISSERTATION FOR THE Ph.D. DEGREE

Each graduate student in the Ph.D. program is required to write a Ph.D. dissertation or thesis on a research topic in mathematics. In consultation with the academic advisor and Graduate Vice Chair, the student is responsible for selecting a dissertation committee. The committee consists of the student’s advisor and at least two other Mathematics faculty members. In special circumstances, a committee member may be chosen from another department and/or from another institution. The student’s advisor is the chair of the committee. All members of the committee must read and approve the dissertation. After the dissertation has been approved, the student is expected to publicly deliver an oral presentation of the mathematical results contained in their dissertation, called the “thesis defense.” Finally, a recommendation by the dissertation committee will be made to the Mathematics Department and to the Graduate Council on the granting of the Ph.D. degree.

VII. TOPICS AND SYLLABI FOR BASIC COURSES

ALGEBRA

Algebra 1 (Math 200)
Group and ring theory: Subgroups, cosets, normal subgroups, homomorphisms, isomorphisms, quotient groups, free groups, generators and relations, group actions on a set. Sylow theorems, semi direct products, simple groups, nilpotent groups and solvable groups. Ring theory, including Chinese remainder theorem, prime ideals, localization, Euclidean domains, PIDs, UFDs, polynomial rings.

Textbooks and references: Basic Algebra I by N. Jacobson, Abstract Algebra by D. Dummit and R. Foote, Algebra by M. Artin.

Algebra II (Math 201)

Linear algebra: Vector spaces, linear transformations, eigenvalues and eigenvectors, Jordan canonical forms, bilinear forms, quadratic forms, bilinear forms, quadratic forms, real symmetric forms and real symmetric matrices, orthogonal transformations and orthogonal matrices, Euclidean space, Hermitian forms and Hermitian matrices, Hermitian space, unitary transformations and unitary matrices, skew-symmetric forms, tensor products of vector spaces, tensor algebras, symmetric algebras, exterior algebras, Clifford algebras and spin groups.

Textbooks and references: Algebra by M. Martin, Abstract Algebra by D. Dummit and R. Foote, Basic Algebra by N. Jacobson.

Algebra III (Math 202)

Module theory: Submodules, quotient modules, module homomorphisms, generators of modules, direct sums, free modules, torsion modules, modules over PIDs and applications to rational and Jordan canonical forms. Field theory, including field extensions, algebraic and transcendental extensions, splitting fields, algebraic closures, separable and normal extensions, the Galois theory, finite fields, Galois theory of polynomials.

Textbooks and references: Algebra by M. Artin, Abstract Algebra by D. Dummit and R. Foote, Basic Algebra I by N. Jacobson.
Note: The following course is recommended as a continuation course to the algebra sequence, and as preparation for the preliminary examination.

**Algebra IV** (Math 203)

Topics include Tensor produce of modules over rings, Projective modules and injective modules, Jacobson radical, Weederburns’ theorem, category theory, Noetherian rings, Artinian rings, affine varieties, projective varieties, Hilberts Nullstellensatz, prime spectrum, Zariski topology, discrete valuation rings; Dedekind domains.


**ANALYSIS**

**Analysis 1** (Math 204)

*Fundamentals of analysis:* Completeness and compactness for real line, sequences and infinite series of functions, Fourier series, calculus on Euclidean space and implicit function theorem, metric spaces and contracting mapping theorem, Arzela-Ascoli theorem, basics of general topological spaces, Baire category theorem, Urysohn’s lemma, Tychonoff theorem.


**Analysis II** (Math 205)

*Measure theory and integration:* Lebesgue measure theory, abstract measure theory, measurable functions, integration, space of absolutely integrable functions, dominated
convergence theorem, convergence in measure, Riesz representation theorem, product measure the Fubini theorem, $L^p$ spaces, derivative of a measure and Radon-Nikodym theorem, fundamental theorem of calculus.

Textbooks and references: Real and Complex Analysis by Rudin, Real Variable and Integration by John Benedetto, Real Analysis by Royden, Measure and Integration Theory by H. Widom.

Analysis III (Math 206)

Functional analysis: Banach space, Hahn-Banach theorem, uniform boundedness theorem, open mapping theorem and closed graph theorem, weak and weak* topology and Banach-Alaoglu theorem, Hilbert space, self-adjoint operators, compact operators, spectral theory, Fredholm operators, space of distributions and Fourier transform, Sobolev spaces.


Note: The following course is recommended as a continuation course to the analysis sequence, and as preparation for the preliminary examination.

Complex Analysis (Math 207)

Review of the basic theory of one complex variable, the Cauchy-Riemann equations, Cauchy’s theorem, power series expansions, the maximum modulus principle, Classification of singularities, Residue theorem, argument principle, harmonic functions, linear fractional transformations, Conformal mappings, Riemann mapping theorem, Picard’s theorem, introduction to Riemann surfaces.

Textbooks and references: Complex Analysis by Ahlfors, Functions of One Complex Variable by Conway, Complex Variables and Applications by Churchill, Elementary Theory of Analytic Functions of One or Several Complex Variables by H. Cartan.
GEOMETRY AND TOPOLOGY

Manifolds I (Math 208)

Theory of manifolds: Definitions of manifolds, tangent bundle, inverse and implicit function theorems, transversality, Sard’s theorem and the Whitney embedding theorem, differential forms, exterior derivative, Stokes’ theorem, integration, vector fields, flows, Lie brackets, Frobenius’ theorem


Manifolds II (Math 209)

Differential forms and analysis on manifolds: Tensor algebra, differential forms and the associated formalism of pullback, wedge product, exterior derivative, Stokes’ theorem, integration, Cartan’s formula for the Lie derivative, cohomology via differential forms, Poincare lemma and the Mayer-Vietoris sequence, theorems of de Rham and Hodge.


Manifolds III (Math 210)
**Algebraic topology:** The fundamental group, covering space theory and the Van Kampen’s theorem (with a discussion of free and amalgamated products of groups), CW complexes, higher homotopy groups, cellular and singular cohomology, the Eilenberg-Steenrod axioms, computational tools (including, e.g., Mayer-Vietoris exact sequences), cup products, Poincare duality, Lefschetz fixed point theorem, homotopy exact sequence of a fibration and the Hurewicz isomorphism theorem, remarks on characteristic classes.


**Note:** The following course is recommended as a continuation course to the geometry-topology sequence, and as preparation for the preliminary examination.

**Differential Geometry** (Math 212)

Principle bundles, associated bundles and vector bundles, connections on principle and vector bundles. More advanced topics: curvature, introduction to cohomology, the Chern-Weil construction and characteristic classes, the Gauss-Bonnet Theorem or Hodge Theory, eigenvalue estimates for Beltrami Laplacian, comparison theorems in Riemannian geometry. (Formerly course 234C.)


**VIII. INDEPENDENT STUDY/THESIS RESEARCH STUDY CODES**

Graduate students must complete an Independent Study/Thesis Research Code Request form (located by the Graduate Mail boxes or in the Mathematics Administrative office), secure the instructor’s approval signature and return it to the
Graduate Coordinator's mailbox. The Coordinator will issue the code via e-mail to the graduate student and copy the instructor.

IX. FINANCIAL SUPPORT

Department Policy for Graduate Student Financial Support
The Mathematics Department is strongly committed to the financial support of graduate students who are making good progress toward either the Masters or the Ph.D. degree. For the purpose of financial support, a student’s progress is measured against the Degree Programs and Timetables. A teaching assistantship is the most common form of financial support for graduate students in good academic standing.

Free Application for Financial Student Aid (FAFSA)
All students are strongly urged to complete a Free Application for Financial Student Aid (FAFSA) each year by the start of fall quarter to determine eligibility for need-based awards and to apply for support from the Financial Aid Office as well as from the department. No need-based fellowship can be awarded to a student who does not have a current FAFSA on file. Students facing special financial hardship are urged to make this known to the department in a timely manner. The department will do everything in its power to ensure that all students in good standing are granted sufficient financial aid to continue their study of mathematics.

X. TEACHING ASSISTANTS

Union
Teaching Assistants are covered by a collective bargaining agreement between the University and the United Auto Workers (UAW). The agreement can be viewed electronically at the following link:

http://atyourservice.ucop.edu/employees/policies/labor_relations/bargaining_updates/ase/completed_contract.pdf

Appointments
TA appointments are usually made at 50% time (an assigned workload of approximately 220 hours for the quarter). Teaching assistants are under the supervision of the faculty member responsible for the course.

**Assignments**

TA assignments are based on course enrollments. Faculty and TAs will be notified of the preliminary assignments as soon as possible. These preliminary assignments are always tentative, pending student enrollment information. Early in the quarter, TAs may be reassigned at short notice, based on the course enrollments.

**Duties**

The specific allocation of TA duties is subject to change depending on enrollments and the number of teaching assistantships available in the department. Instructors and their teaching assistant(s) will meet at the beginning of the quarter to complete the *Notification of TA Duties* form, which will establish agreed-upon tasks. The performance of these tasks will form the basis of the end-of-quarter performance evaluation, and will rely upon the following criteria: quality of work; accuracy and attention to detail; interaction with students, peers and instructor; knowledge of subject; dependability.

Teaching Assistants are hired for the period specified in their appointment letter and are expected to conduct their TA duties for the period assigned in a professional manner.

Please note that some classes now utilize online grading, which means there may be no homework for faculty, readers or TAs to grade. In other cases, one or more readers may be assigned to the class to grade homework. In general, TA duties will likely include the following:

- TAs for upper-division courses may be asked to grade some of the homework in addition to leading 1-2 sections, writing solutions, holding 3-5 office hours, and assisting with grading midterms and finals
- TAs of lower-division courses (depending on enrollment) may be asked to grade some of the homework (except where online grading is in use or readers are
assigned) in addition to leading 2-3 sections, writing solutions, holding 3 office hours, and assisting with grading midterms and finals
- TAs of entry-level math courses will be expected to lead 3-4 sections, write solutions, hold 3 office hours, and assist with grading midterms and finals.

**TA Training**
All TAs are required to participate in the department’s Teaching Assistant training program. Professor Frank Bauerle is the TA Trainer for the Mathematics Department, and he conducts a training session at the beginning of each school year to prepare first-time teaching assistants as well as a second session including all TAs in our program. Additional workshops are conducted at the beginning of each quarter, and ongoing advising, coaching, and mentoring is provided to teaching assistants to prepare them for excellence in the classroom.

**Four-Year Rule (12 Quarters)**
The total length of service rendered in any one or any combination of the following titles may not exceed four years or (12 quarters): reader on annual stipend, teaching assistant teaching fellow and/or associate. Under special circumstances, the Dean of Graduate Studies may authorize a longer period, but in no case for more than six years (18 quarters).

**XI. LEAVE OF ABSENCE POLICY**
A student wishing to apply for a leave of absence must complete a Request for Leave of Absence form available from the department office or online at http://graddiv.ucsc.edu/student_affairs/forms.php#enrollment. Department signatures are required. Only students in good standing are eligible for an approved leave of absence, which will be granted for sound educational purposes, health reasons, financial problems and family responsibilities. The maximum term for an approved leave of absence is three academic quarters.
A request to renew a leave of absence must be submitted in advance to the Graduate Dean. Substantial justifications and department approval will be required to obtain a renewal.

While on a leave of absence, a student is not permitted the use of University facilities. All financial aid (including Teaching Assistantships and other fellowships) terminates when a student is on a leave of absence. If a student accepts any University employment, staff or academic, while on a leave of absence, it must be reported to the Division of Graduate Studies.

XII. FILING FEE

A candidate in good standing for a Master’s or Ph.D. degree need not be a registered student in the quarter in which they file the thesis or dissertation if, prior to the beginning of that quarter, the candidate has met all the other requirements for the degree and is in good standing. Instead of paying the University Registration fee (and nonresident tuition as applicable), the student is required to pay only the Filing Fee, amounting to one-half of the regular term University Registration Fee.

In order to be eligible for a filing fee, a student must have been either on an approved leave of absence or registered in the previous quarter.

A student using the Filing Fee should submit the application for Filing Fee, signed by all members of the Reading Committee by the end of the second week of the quarter. The signatures signify that all members have read the thesis.

XIII. READMISSION POLICY

Students on an approved leave of absence will automatically be readmitted in the quarter of return indicated on the Request for Leave of Absence form, unless there are conditions placed on readmission by the department, the Graduate Dean, or the Health Center.
Students wishing to reenter UCSC who are not returning from an approved leave of absence must file a readmission form with the Division of Graduate Studies and pay a readmission fee. A Statement of Legal Residence form must also be completed and sent to the Office of the Registrar. Students should obtain and file these forms in the Division of Graduate Studies at least six weeks prior to the beginning of the quarter in which the student plans to enroll.

XIV. POLICY ON PART-TIME GRADUATE STUDY

A part-time graduate student has approval to enroll for one-half (or less) of the regular course load of ten units (first year graduates) or fifteen units (continuing graduate students).

The Mathematics Department will permit part-time study when (in the opinion of the faculty) there is clear justification for part-time status based upon consideration of academic progress, career employment, family responsibilities, or health conditions. The Graduate Division gives final approval of part-time status.

Part-time students will accrue time-to-degree under the Normative Time to Degree Policy at one-half the rate of full-time students for those quarters during which they are approved for part-time study.

A part-time student will pay the full Registration Fee, and one-half the Educational fee paid by full-time students. Nonresident students approved for part-time status will pay one-half the nonresident tuition charge.

University employment in student titles such as Teaching Assistant and Graduate Student Researcher cannot exceed .25 FTE for part-time students.

XV. GRIEVANCES

The Mathematics Department is committed to fair treatment for all graduate students. Students who have a grievance concerning their academic progress are urged to first
consult the professor responsible. If this is not satisfactory, students should consult the Graduate Vice Chair. If the grievance is still not resolved, students have the right to present the situation to a committee made up of the Department Chair, Graduate Vice Chair and their Advisor, with the Undergraduate Vice Chair substituting if the graduate has no advisor.

XVI. RESOURCES:

Graduate students are encouraged to consult the following web pages for additional information concerning campus policies and calendars that govern their studies:

Division of Graduate Studies: http://www.graddiv.ucsc.edu
Office of the Registrar: http://www.reg.ucsc.edu
Financial Aid Office: http://www2.ucsc.edu/fin-aid/
Career Center: http://www2.ucsc.edu/careers/