PH.D. PROGRAM
MATHEMATICS EDUCATION

HANDBOOK

2009
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I. INTRODUCTION

This handbook provides important information about the Ph.D. program in Mathematics Education. It includes policies and procedures established by and specific to the program.

It is designed to supplement the University of Massachusetts Dartmouth (UMD) Graduate Catalog that contains material related to student rights, academic policies, registration, tuition, fees, financial aid, campus facilities, and course offerings. A full listing of UMD graduate requirements can be found in the Graduate Catalog. Students are responsible for being familiar with these requirements. Rules and procedures pertaining to the code of student conduct, confidentiality of academic records, resolution of problems, human subjects protection, faculty conduct, and student governance are not reproduced in this handbook.

This handbook is not a contract. While every effort is made to ensure the accuracy of the information in this handbook, the program reserves the right to make changes.

II. PURPOSE AND GOALS

II.A. Program Link with Campus Mission Priorities

The goals and purposes of the Ph.D. in Mathematics Education are firmly in line with the mission of the University: “The University of Massachusetts Dartmouth distinguishes itself as a vibrant public university actively engaged in personalized teaching and innovative research, and acting as an intellectual catalyst for regional and global economic, social, and cultural development.” It advances the university’s mission by creating an environment to conduct research through collaboration with industry, research and academic institutions, and practitioners of innovative mathematics education research at the national and international level, and by using best teaching practices in educating its students.

II.B. Program Purpose

The primary aim of the doctoral program is to produce stewards of the discipline, as defined by The Carnegie Foundation for the Advancement of Teaching in its Initiative on the Doctorate: “to educate and prepare those to whom we can entrust the vigor, quality, and integrity of the field.” Moreover, its explicit interdisciplinary approach, that has deep connections nationally and internally
and reflects cutting-edge technological innovations in program delivery, is intended to address specific challenges identified by the Carnegie Initiative (Walker, Golde, Jones et al., 2008). These challenges involve new technologies in “altering and accelerating the way new knowledge is shared and developed” (p. 2), a vision of a global marketplace for scholarship, and recognition that “much of the most important, path-breaking intellectual work going on today occurs in the borderlands between fields, blurring boundaries and challenging traditional disciplinary definitions” (p. 2). Our program pays particular attention to how curricular and research components can be integrated systematically to connect students’ learning to faculty scholarship and thereby provide authentic learning experiences that produce graduates with strong research skills. We are guided by a metaphor of apprenticeship as a “theory of learning and a set of practices that are widely relevant” (p. 91); the activity of apprenticing encompasses and strengthens all curricular and research components of the doctoral program.

The Ph.D. in Mathematics Education builds on the success of existing research programs at UMass Dartmouth, particularly those situated in the Kaput Center for Research and Innovation in STEM Education (hereafter noted as the Kaput Center). Our program and the Kaput Center share common goals and approaches. Much more than a collection of projects, the Center is an intellectual community that fosters “intellectual risk taking, creativity, and entrepreneurship” (see Walker et al., 2008, p.11) and, in the spirit of the Carnegie Initiative’s formation of scholars, offers incubation through which a doctoral program can provide “real partnerships between faculty and students, habits of respect for and interest in one another’s work, and the lively exchange of ideas in which new knowledge is formed and transformed” (p. 11).

The innovative research of the Math Ed faculty within the Kaput Center provides a core strength for the program and establishes its uniqueness in comparison with other doctoral programs in the Commonwealth of Massachusetts and many other institutions.

The research interests of the Math Ed faculty cover grades K-20 and a wide range of contemporary issues in mathematics education: Algebraic thinking grades K-20, improving mathematics teaching through district-wide collaboration, integrating new technological innovations (e.g., wireless connectivity and haptic devices) in K-12 mathematics classrooms and its impact on participation and motivation, developing proof-based reasoning from elementary through undergraduate classrooms, evolution of symbol use and symbolic thinking in mathematics, theories of mathematical learning and teaching from multi-disciplinary perspectives, teacher knowledge and professional development in the middle grades, and efficacy studies and diffusion of innovation. A majority of these interests are being explored through projects funded by the National Science Foundation and the US Department of Education.

Mathematics education is critical in a global economy for which understanding the technical sciences is an essential currency. The doctoral program in Mathematics Education at UMass Dartmouth offers innovative answers to critical needs in teaching and learning mathematics by providing future
mathematics educators with the educational infrastructure and advanced research training to become leaders in the field of mathematics education.

II.C. Learning Objectives: Knowledge and Skills to be Acquired by Program Graduates

The program is designed to attract and educate students of diverse backgrounds for employment in a variety of educational and scientific institutions, industries, and federal agencies. It focuses on interdisciplinary perspectives within mathematics education research. Our graduates will be highly competitive in today’s marketplace for educational scholars within a wide range of actual employment classifications. Furthermore, our Ph.D. candidates will enjoy multiple opportunities for enhancing traditional scholarly training through participation in such practical academic endeavors as publishing and organizing lectures and colloquia.

The doctoral program will provide students with the knowledge and skills to

a. re-construct, appropriate, and develop mathematical knowledge;  
b. explore different approaches that emerge from the study of the research literature in the field of mathematics education and related disciplines; and  
c. write original research that represents their own contribution to knowledge.

Graduates of the program should be able to produce original research reflecting deep social and cultural commitments. The Ph.D. program is designed to build the intellectual skills that our graduates will need to utilize new and future technologies and communication infrastructures and to develop these into knowledge environments. In so doing, graduates will formulate and design solutions to complex educational problems.

The Ph.D. in Mathematics Education is also designed to create a focused track of study over 4 years to build skills in the following critical areas:

a. the nature of scientific inquiry in mathematics education and related disciplines;  
b. appropriate methods of research design regarding data collection and analysis, particularly focused on contemporary qualitative and quantitative methods (e.g. HLM, discourse analysis, micro-analytical video analysis)  
c. the production of new researchable questions, especially on the boundaries of particular disciplines (e.g. learning sciences), and  
d. the ability to design and conduct a research study with unique findings to advance the field of mathematics education.
This experience will involve a continual and iterative research process beginning in the first year of study that culminates in a Ph.D. dissertation at the end of 4 years.

II.D. Strategies for Assessing Graduates’ Skills and Ongoing Program Quality and Effectiveness

The program employs the following three strategies to ensure effective delivery:

a. Student E-portfolios;
b. Faculty Evaluation and Assessment Procedures; and
c. Internal and External Advisory Councils;

Student E-Portfolios: Students will construct e-portfolios of their learning experiences across the course of the program via an on-line proprietary database developed by Kaput Center faculty and staff (incorporating PHP/MySQL and a Mac XServe configuration) to allow PodCasts and workflows from multi-media sources. Students will upload assessments of individual courses and end-of-year program evaluations based on expected learning outcomes of the program. Students will also upload extramural activities such as papers or presentations that they have developed with or without the support of faculty, as well as other artifacts that they count as evidence of their learning. The resulting reflections and artifacts will be assessed by faculty and other evaluators.

Faculty Evaluation and Assessment Procedures: A survey instrument, based on course and end-of-year learning outcomes and objectives, will be administered to students and external evaluators in order to measure the achievement of program outcomes. Students will react to these criteria in their e-portfolios, while faculty, administrators and evaluators will be able to export these as reports from the e-portfolio portal. Faculty will also use assessment procedures for each of the major milestones of the program, such as the qualifying examination, the dissertation proposal defense, and the final defense of the dissertation.

Internal and External Advisory Councils: Annually, faculty reviewing the students’ e-portfolios and their performance at progression milestones will summarize results for review by the Dean of the School of Education, Public Policy, and Civic Engagement. The Dean will report these results to central administrators such as the Associate Provost for Graduate Studies and the Provost; sample student e-portfolios may be provided. Focus groups of Ph.D. candidates will provide feedback. An Executive Advisory Council (which will include members of the Kaput Center Advisory Board) will receive summary reports on a biannual basis to assess whether the program is meeting its expected goals and may also view sample student e-portfolios. These three core strategies supplement other methods in use, such as traditional peer-evaluation, end-of-year Examination Board meetings (where all relevant teaching faculty meet to assess student achievement and assess grades), and the five-year cycle of AQAD
external review procedures. Results from student surveys of future employment will be added to their portfolios after graduation as we continue to track whether our students enter into the expected career trajectories.

II.E. Benchmarks to Determine the Accomplishment of Program Goals

Benchmarks designed to determine accomplishment of program goals are designed around 5 key areas: Faculty; Students; Research; Program of Study; and Resources. Indicators for each of these areas include the following:

Faculty
- Faculty members meet the requirement of the institution for graduate education with all faculty members holding the earned doctorate.
- Faculty members conceptualize and implement productive programs of research and scholarship.
- Faculty members design and deliver high quality instruction synergistically linked to current research as well as their own particular research programs.
- Faculty members create an environment in which mentoring, socialization of students, and the existence of a community of scholars is evident.

Students
- Students are selected from a pool of highly qualified applicants in accordance with admission criteria consistent with those of the institution.
- Students actively develop research skills and knowledge of the field to prepare them as “stewards of the discipline.”
- Students develop an expertise of scholarship through participation in authentic learning experiences.

Research and Scholarship
- Research is an explicit component of the mission of the institution and a core feature of the program design.
- Strong research programs, developed over a number of years and now facilitated through the Kaput Center, exist to support the goals of the program.
- Faculty will maintain a level of scholarly productivity commensurate with the needs of the program.

Program of Study
- The program of study reflects the interdisciplinary nature of mathematics education, drawing on multiple fields of knowledge to strengthen scholarship.
- Core content is provided through an approach that integrates curriculum and research activity.
- Student scholarship is developed through progressive research experiences based on collaborations with faculty at the host institution as well as partner institutions.
Resources

- Faculty resources will be added to maintain the program and accomplish its goals.
- Technical and support services are available and accessible to faculty and students.
- Library and database resources are available to support the program.
- Space and equipment (e.g., computers; seminar rooms; study and social areas) are available to students.

Data on these indicators will be periodically collected and reviewed to assess needs for program improvement.

III. PROGRAM OF STUDY

III.A. Description of the Curriculum

The program involves a high degree of required courses supplemented by specific electives. In particular, students will complete 72 credits that include 18 credits of introductory coursework to develop students’ knowledge of research tools, methodologies and theories in mathematics education research, 18 credits of preparatory coursework to refine and focus students’ understanding of the research process and theory building, and 36 hours of advanced doctoral coursework including dissertation research.

The Ph.D. in Mathematics Education falls into three distinct phases:
1. Introduction to mathematics education research,
2. Preparation Phase for advancement to advanced doctoral status, and
3. Production Phase of advanced courses and final dissertation.

At an appropriate level, all courses feature authentic learning experiences in research institutions and projects, and an interactive thinking/writing process to develop cutting-edge research and discovery as part of the student’s experience. Research scholarship thus pervades the curriculum, uniting theory and practice. Technology is also embedded throughout: wherever possible, courses will be blended with a variety of delivery methods, including on-line video seminars, iTunesU/Podcasting, and active use of Blogs and Wikis, as part of the regular mode of sharing and learning content and expressing evolving ideas in and around coursework. A central Blog/Wiki will be available for students to interact and share their ongoing work outside of classes.

Because of the program’s central focus on the development of research scholarship, specific attention is given to the development of research ethics, including appropriate acknowledgement of sources, proper protocols for conducting research on human subjects, the process of institutional IRB
approval, and institutional certification for conducting research (i.e., CITI certification).

III.B. Academic Integrity and Subject Area Coverage

Academic integrity of the program is maintained through the administration of a strong, connected program of coursework and research experiences that reflect the demands of the field of mathematics education. In particular, the program includes relevant, focused coursework that addresses foundational issues in mathematics education. A focus on the development of research skills and practices is threaded throughout this coursework to support students’ transition from the practice of research skills with supervision to independent mastery of research scholarship. In particular, students will be mentored through the Introductory and Preparatory Phases of the program (Years 1 and 2) in the practices of research and will demonstrate their skills in successful completion of the qualifying examination. Years 3 and 4 are designed to support increasing autonomy in students’ ability to design and implement a research study, culminating in the dissertation.

The program’s faculty are leaders in the field of mathematics education, and through their established research programs and international connections with researchers through the Kaput Center present a program that not only addresses contemporary issues but also relevant research paradigms and methodologies appropriate for complex questions in the field today.

III.C. Course Sequencing

Figure 1 offers a schematic outline of how the program can be complete by a full-time student in 4 years. For each element, we describe the individual components and rationale. In summary, students will complete 72 credits that include:

- a. 18 credits of introductory coursework to develop students’ knowledge of research tools, methodologies and theories;
- b. 18 credits of preparatory coursework to refine and focus students’ understanding of the research process; and
- c. 36 hours of doctoral work (12 hours of doctoral coursework and 24 hours of dissertation research advising to support and guide the production of the final dissertation).

While the program is intended to be a four-year program for full-time students, part-time students or ABDs are permitted to complete their requirements in up to six years. Requests for extensions will be considered on a case-by-case basis in line with the rules and regulations for graduate study at UMass Dartmouth.
<table>
<thead>
<tr>
<th>Year</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
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<tr>
<td>1 (Introduction)</td>
<td>Introduction to Qualitative Methods (MTE650) – 3 cr.</td>
<td>Theories of Mathematical Learning (MTE653) – 3 cr.</td>
</tr>
<tr>
<td></td>
<td>Introduction to Quantitative Methods (MTE651) – 3 cr.</td>
<td>Research Seminar – Capstone Course (MTE654) – 3 cr.</td>
</tr>
<tr>
<td>Total</td>
<td>9 credits</td>
<td>9 credits</td>
</tr>
<tr>
<td>2 (Preparation)</td>
<td>3 Topics in Mathematics Education Research (MTE660-679) – 9 cr.</td>
<td>Research Seminar – Capstone Course (MTE681) – 3 cr.</td>
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<tr>
<td></td>
<td></td>
<td>Developing Research Skills Pt.2 (MTE682) – 3 cr.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Qualifying Exams</td>
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<td></td>
<td>Authentic Learning - Internship (MTE680) – 3 cr.</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9 credits (average)</td>
<td>9 credits (average)</td>
</tr>
<tr>
<td>3 (Production)</td>
<td>2 Advanced Doctoral Courses from MTE750-769 – 6 cr.</td>
<td>2 Advanced Doctoral Courses from MTE750-769 – 6 cr.</td>
</tr>
<tr>
<td></td>
<td>Select Dissertation Committee Chair</td>
<td>Dissertation Proposal Defense (end-of-year)</td>
</tr>
<tr>
<td>Total</td>
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<td>9 credits</td>
</tr>
<tr>
<td>4 (Production)</td>
<td>Dissertation Research (MTE774) – 9 cr.</td>
<td>Dissertation Research (MTE775) – 9 cr.</td>
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<tr>
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<td></td>
<td>Final Oral Defense (end-of-year)</td>
</tr>
<tr>
<td>Total</td>
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<td>9 credits</td>
</tr>
<tr>
<td>Grand Total</td>
<td>36 credits</td>
<td>36 credits</td>
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Figure 1. Program of study

Year 1 requires core courses to be successfully completed; there is no variation in the offerings.
Year 2 allows for some choice of topics within the courses outlined below (subject to courses offered). Additionally, there is some flexibility in when students can take their internship (MTE 680) in Year 2. In particular, the internship can be completed in the Fall or Spring semester, extended throughout Fall and Spring, or during the summer. Decisions about this aspect of the internship will depend on the nature of the internship, including particularly whether the student wants to travel out-of-state or be part of an International Exchange project or whether the internship is best facilitated by a long-term field experience. An essential criterion is that the internship reflect a 3-credit course. Internships will be flexibly scheduled on a case-by-case basis, with the representative course (MTE 680) being offered all year round.

As part of the required coursework (specifically, MTE 655, 682 and, depending on the student’s focus, MTE 680), students will be expected to design and complete a pilot study during Years 1 and 2. This requirement will necessarily relate closely to content and skills addressed in coursework in Years 1 and 2. This is likely to be part of a research project conducted at the Kaput Center or through one of its associates, or students may start their own research project in local schools or undergraduate classrooms. The study should reflect the student’s synthesis of knowledge gleaned from coursework during the Introductory and Preparatory phases and concerning the nature and process of research, the use of appropriate methodologies, the application of relevant theories of learning, and the development of scholarly writing skills. It will culminate in the qualifying examination.

Upon satisfactory completion of the 36 credits designated in Years 1 and 2, students are eligible to take the qualifying examination to enter the Production Phase of the doctoral program. Successful completion of coursework requires that the student have a cumulative GPA not less than 3.0. Qualifying examinations that are not passed initially may be repeated once. Following the successful completion of the qualifying examination for the Preparation Phase, along with the successful completion of any additional coursework to address deficiencies identified in the student’s admission to the program, the student will start advanced doctoral coursework and the dissertation.

Students who enter the program with a bachelor’s degree will complete the entire course sequence. “Advanced Standing” can be given to applicants who enter with an advanced degree in an appropriate background (e.g., MS/MA in Mathematics Education, Mathematics, or a related social or technical science). Advanced Standing permits the waiver of up to 12 credits within first and second year courses. However, it is important to note that the entry level of the program is intended to be for students who hold a Master’s degree or equivalent. As such, a designation of Advanced Standing or waiver of courses within Years 1 and 2 is rare. A decision to offer Advanced Standing or to require additional

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1 Additionally, students with provisional acceptance into the program will also be required to complete any additional coursework, identified in their official notification of admission, prior to entering the Production Phase.
coursework to address background deficiencies is made along with other admissions decisions.

Advising is important, and students interrelate closely with faculty at all levels of study. Students will choose faculty in the first 2 years to advise them on their research experiences that culminate in the qualifying examination. More than one faculty member can thus serve an introductory student, and the faculty member(s) may be different than the student’s Dissertation Committee Chair selected for the Production phase for Years 3-4. Work in the first two years will develop a student’s potential to conduct research and the skills necessary to complete his/her final dissertation. This is assessed in the qualifying examination. At the Production stage in Years 3-4, a student will choose one faculty member as his/her Dissertation Committee Chair for the remainder of the program (this faculty member will be the instructor of record for Dissertation Research MTE772-775 to that student).

The following courses will be required for completion of the program.

III.C.1. Year 1
6 core requirements
MTE650 – Introduction to Qualitative Methods
MTE651 – Introduction to Quantitative Methods
MTE652 – Introduction to Mathematics Education Research
MTE653 – Theories of Mathematical Learning
MTE654 – Research Seminar.

III.C.2. Year 2

Semester one
Students will be offered three topics courses from the following list

MTE660 – Foundational Issues in Mathematics Education
MTE661 – Research on Mathematics Teacher Education Part 1
MTE662 – Research on Mathematics Teacher Education Part 2
MTE663 – Developing & Implementing Mathematics Curriculum
MTE664 – Research on Technology in Mathematics Education
MTE665 – Design Principles for Technology in Mathematics Education
MTE666 – Frameworks for Research Analysis
MTE667 – Research in Elementary Grade Mathematics
MTE668 – Research in Middle & High School Mathematics
MTE669 – Research in Undergraduate Mathematics Education
MTE670 – Developing Theory
MTE679 – Topics in Mathematics Education

Semester two
MTE680 – Authentic Learning (Internship).
MTE681 – Research Seminar.
The program will offer core mathematics courses to students admitted conditionally based on a deficiency in their mathematical preparation. These courses focus on the development of smart mathematical knowledge that develops students’ understanding of the use and application of this knowledge in mathematics education. The courses will address a K-20 approach to the following essential topics in mathematics:

1. Algebraic thinking,
2. Mathematics of Change and Variation
3. Mathematical Proof
4. Geometric reasoning
5. Discrete Structures
6. Number Theory
7. Mathematical Problem Solving

Students admitted conditionally based on a mathematics deficiency will be required to take up to 12 credit hours of these courses in addition to existing program course requirements.

Additionally, students who have no K-16 teaching experience will be advised to complete a teaching internship prior to qualifying for the Production Phase of the program. This will be indicated on the student’s official acceptance into the program.

Any identified deficiencies regarding admission requirements (i.e., in students’ mathematical preparation or in students’ teaching experience) will be met prior to entering the advanced doctoral phase of the program (Production Phase).

III.C.3. Qualifying Examination

The qualifying exam should demonstrate the skill set that the student has developed through the Introductory and Preparatory Phases of the doctoral program.

Students are eligible for the qualifying examination upon satisfactory completion of the 36 credit hours of coursework (with no incomplete grades) designated for Years 1 and 2. The qualifying exam includes:

1. submission of an 8000-word paper, based on the student’s pilot study completed during Years 1 and 2, to the Graduate Committee for evaluation along the lines of the skill sets developed in the student’s coursework;
2. submission of a proposal to present research to a national or international conference based upon the student’s pilot study completed in Years 1 and 2;
3. presentation of the student’s pilot study in the Kaput Center; and
4. an [oral, written, or both] examination based on coursework completed in Years 1 and 2.

Upon approval of successful completion of these criteria by the Graduate Committee, the Graduate Program Director certifies to the Office of Graduate Studies and Admissions that the student has satisfactorily completed the Qualifying Examination.

Successful completion of Qualifying Examination\(^2\) admits the student to candidacy for the Ph.D. degree and enables the student to begin formal work on the dissertation.

III.C.4. Year 3

During the Production Phase, students will continue their doctoral training through advanced coursework. In addition, they will conduct Dissertation Research with a faculty member. During Year 3, dissertation research is expected to focus on conducting a full literature review, framing the main issues and guiding points of the study, and collecting research data. It is expected that the student will also complete the preliminary writing phase of the dissertation in preparation for the proposal defense at the end of Year 3. It is expected that the student will keep the selected faculty advisor through the completion of the Ph.D. Dissertation during Years 3 & 4. During the third year, the student will identify a Dissertation defense committee and chair (assumed to be their main faculty advisor), and complete the defense of the Dissertation proposal at the end of Year 3 after all coursework is completed. (See also section III.E. Dissertation).

During Year 3, students will complete 4 advanced doctoral courses from the following list:

- MTE750 – Analyzing Participation and Engagement in Mathematics Classrooms
- MTE751 – Contemporary Issues in Elementary Grade Classrooms
- MTE752 – Research on Proof and Reasoning in Mathematics
- MTE753 – Applied Research on Technology in Mathematics Education
- MTE754 – Semiotics and Symbolic Cognition
- MTE755 – Principles of Creativity & Innovation in Mathematics Education
- MTE756 – Advanced Theoretical Development
- MTE769 – Advanced Topics in Mathematics Education
- MTE772 & 773 – Dissertation Research

While many students’ dissertation research will be supervised by a member of the core Mathematics Education faculty, faculty from other departments or

\(^2\) Students with provisional admission into the program will be expected to have completed any specified additional preparation before advancing to the Production Phase.
institutions can co-advise dissertations alongside a member of the core Math Ed faculty (if approved by the Graduate Program Director in consultation with the Graduate Committee and the Dean of the School). In this case, the UMass Dartmouth Mathematics Education faculty member would be the Primary Dissertation Chair. The use of an adjunct supervisor can provide an authentic learning experience that converges lines of research and coursework to enrich the project and experience of the student.

Students’ Dissertations will build on their work completed in the preliminary years, relying on research skills developed particularly in courses MTE655/682 (Developing Research Skills Parts 1&2).

III.C.5. Year 4

Students will be expected to work primarily on their final Dissertation, through registration in MTE774 and MTE775. These two courses permit a student to receive 18 credits of instruction to assist in the completion of his or her research study and the writing of the final Dissertation.

The final oral defense examination will be completed at the end of Year 4 on submission of the final Dissertation.

III.D. Course Descriptions

All courses are 3 credits each unless otherwise stated.

*MTE650 – Introduction to Qualitative Methods*
This course examines qualitative research methods applied to mathematics education research. Students will learn about qualitative research design, including techniques for collecting and analyzing qualitative data, and ethical considerations for conducting research with human subjects. Students will develop a researchable topic in mathematics education, select and implement an appropriate qualitative research design, and analyze and interpret qualitative data. Results of the project will be written in a final report using APA format and will be presented orally.

*MTE651 – Introduction to Quantitative Methods*
This course integrates research design, data analysis, data interpretation, and APA format report writing across the two dominant paradigms in contemporary psychology. The course includes the use of the SPSS statistical software for univariate parametric and some non-parametric models. The course contains a strong experiential component to prepare students for thesis writing.

*MTE652 – Introduction to Mathematics Education Research*
This course will introduce Ph.D. students to fundamental problems pertaining to mathematics education that have been instrumental to constitute and define it as a research field. Students will be introduced to important ideas in the field and
why these ideas are significant in defining the activity of research in mathematics education. The study of how these theoretical and pragmatic problems have been approached by a community of researchers will help students understand, in broad terms, the nature of research in the field and, at the same time, offer a panorama of new areas of inquiry that are presently being transformed into research programs.

*MTE653 – Theories of Mathematical Learning*
This course will examine contemporary theories of learning psychologies and their applications to research in mathematics education. The course is intended to help students understand ways of knowing and how this drives research. Particular attention will be given to enabling students to situate their research in relevant theoretical frameworks and understand the implications of theoretical frameworks on research design.

*MTE654 – Research Seminar*
This is a capstone course designed to synthesize critical research processes, theories of learning, and current research themes in mathematics education to which students are introduced in their first year. From this synthesis, students are expected to select and refine a researchable topic for their pilot study to be conducted during the Introductory and Preparatory phases of the doctoral program (Years 1 and 2). The course will also give explicit attention to ethics in research, including appropriate forms of acknowledgment in the use of existing research and proper protocols and procedures for conducting research on human subjects.

*MTE655 – Developing Research Skills Part 1*
This course will focus on building the skill set necessary to conduct research for the dissertation, most likely focused on background fundamental issues in mathematics education research. It will build exploration, analysis and writing skills. Students will learn the skills to give shape to their thinking. In particular, during this course, students will be expected to identify a problem for which they will conduct pre-pilot study in preparation for the pilot study to be conducted during the Introductory and Preparatory phases of the program.

*MTE660 – Foundational Issues in Mathematics Education*
Students will be introduced to the fundamental problems and issues in mathematics education research, historical perspectives, present research perspectives and future trajectories of research including interdisciplinary perspectives on potential solutions and cutting-edge approaches. The course will expect students to understand and analyze the present status of the field of mathematics education and viable approaches to addressing foundational issues.

*MTE661 – Research on Mathematics Teacher Education Part 1*
This course will introduce students to research on pre-service and in-service teacher learning and teacher education. It will critically examine the research base concerning contemporary learning theories and their application to teacher learning. It will also study current effective forms of teacher professional development and pre-service education and the research supporting these
approaches. Students will critique competitive grants funding research on teacher learning and professional development as a way to learn about current trends and to develop grant-writing skills.

**MTE662 – Research on Mathematics Teacher Education Part 2**
This course extends the concepts studied in MTE661 through applied research in an authentic teacher learning setting. To initiate this, students will write a mock grant proposal to conduct original research with teachers. The proposal should reflect clear connections to the research base studied in MTE661 as well as the research skills being developed during Years 1 and 2. It will be refined through critique by student review panels prior to implementation of the study. After implementation of the study, students will analyze their findings, prepare a written analysis for peer review, and present their findings to the class.

**MTE663 – Developing & Implementing Mathematics Curriculum**
This course focuses on analyzing grades K-16 curriculum, intentions for students’ learning outcomes, associated pedagogical styles and integration. Students will examine existing reform and basal curricula texts, and the development of new activities and activity structures that replace or transform existing texts based upon present mathematics education theory and new technologies. Students will also be introduced to issues behind curricula reform and integration focusing on fidelity of implementation.

**MTE664 – Research on Technology in Mathematics Education**
This course aims to explore important areas of mathematics through the use of innovative digital technologies. We will examine how certain technologies can be used to transform the introduction of a mathematical topic in such ways that the learner can represent, understand and develop symbolic reasoning in a conceptual and more applicable way. Here we explore the use of dynamic, interactive mathematics including simulations and affordable visualization tools and analyze related research literature on their impact on teaching and learning.

**MTE665 – Design Principles for Technology in Mathematics Education**
This course focuses on the design principles of 21st Century digital technologies and their particular role in transforming communication and representation in mathematics classrooms. Students will analyze and critique the specific designs and functionality of a suite of technologies with particular focus on their impact on pedagogy, classroom discourse, conceptual development, assessment and new forms of mathematical expression. When possible, leading software designers will be included in the course as guest speakers.

**MTE666 – Frameworks for Research Analysis**
This course focuses on the development of a specific set of research tools relevant to the study of mathematical reasoning in a variety of contexts, including the analysis of mathematical discourse, gesture, flow of interaction, and learning outcomes such as pre-post tests of content. Attention will be spent connecting research methods to theoretical frameworks and practical outcomes of analysis. Students will be expected to produce a specific analysis of some classroom data.
MTE667 – Research in Elementary Grade Mathematics
This course examines current research on issues of teaching and learning elementary grades mathematics. It will focus on central research questions and findings in the field, research designs framing this work, and relevant theories of learning and their application in the research base. While particular focus will be given to early algebraic thinking, the course will overview significant areas of research and their connections to current educational reforms. In addition, students will be expected to conduct a research project on children’s mathematical thinking in a specific area of research (e.g., early algebra, fractional thinking). The design, implementation, and analysis of the study should reflect the student’s understanding of core components of research being developed in Years 1 and 2.

MTE668 – Research in Middle & High School Mathematics
This course examines current research on issues of teaching and learning middle and high school mathematics. It will focus on central research questions and findings in the field, research designs framing this work, and relevant theories of learning and their application in the research base. While particular focus will be given to middle and high school algebra, geometry, and data analysis, the course will overview significant areas of research and their connections to current educational reforms. In addition, students will be expected to conduct a research project on children’s mathematical thinking in a specific area of research (e.g., proportional reasoning). The design, implementation, and analysis of the study should reflect the student’s understanding of core components of research being developed in Years 1 and 2.

MTE669 – Research in Undergraduate Mathematics Education
This course examines current research on issues of teaching and learning undergraduate mathematics. It will focus on central research questions and findings in the field, research designs framing this work, and relevant theories of learning and their application in the research base. While particular focus will be given to advanced mathematical thinking, the course will overview significant areas of research and their connections to current educational reforms. In addition, participants in the course will be expected to conduct a research project on undergraduate student’s mathematical thinking in a specific area of research. The design, implementation, and analysis of the study should reflect the student’s understanding of core components of research being developed in Years 1 and 2.

MTE670 – Developing Theory
This course will enable students to understand a theory as an artifact to generate interpretations of research problems and their data. It intends to develop the skills necessary to delineate answers to carefully chosen aspects of research questions, from alternative theoretical views with respect to the one originally used to investigate the problem in question. The course will offer students the opportunity to display their actual understanding of the main streams of the discipline as well as some basic methods and techniques conducive to research.
MTE679 – Topics in Mathematics Education
This course allows for individual and/or group study under supervision of a mathematics education faculty member in an area of mathematics education research that is not otherwise part of graduate course offerings.

MTE680 – Authentic Learning (Internship).
This course will be conducted at the Kaput Center or at a national or international research institution. Students will be mentored by an Adjunct Research Associate at the host institute to develop research skills through activities such as data collection and analysis and to enhance awareness of the complexities of educational research. Host institutions will provide a “mentor” who is an Adjunct Research Associate of the Kaput Center. The operation of the Kaput Center assures this would be a suitable mentor to apprentice a student in the field of research. It is expected that, while the course would be the administrative responsibility of a Math Ed faculty member, the mentor at the affiliated institution would be the main instructor. An assigned Math Ed faculty member, as the instructor of record, will monitor the progress of the student through consultation with the mentor. The time spent by a student at the mentoring institute will be negotiated based on the geographical location and will be consistent with a 3 credit-hour course.

MTE681 – Research Seminar
This is a second capstone course aimed at preparing a student for their qualifying exams by synthesizing the lessons learned by the authentic learning experience and focusing research questions in preparation for their advanced coursework. In addition, the course will focus on formal writing both for grant applications, scholarly articles and the dissertation.

MTE682 – Developing Research Skills Part 2
This course aims to synthesize prior coursework/research experience, focusing on methods and research questions, in preparation for students’ main research project in Year 3. It also focuses on the development of skills to defend one’s work and preparation for the written component of the student’s qualifying exams. Students will develop essential experience/skills in designing research, reading research critically, writing scholarly work, and developing proposals for research funding. Students will give oral presentations on their research topics and plan of study for peer review.

MTE750 – Analyzing Participation and Engagement in Mathematics Classrooms
In this course, students will observe real-life examples of complex classroom interactions. They will learn to document and analyze these interactions from a number of theoretical perspectives, including gesture and linguistic anthropology. Micro-analytic video analysis will be used for tracking interaction cycles and participation frameworks in classrooms and understanding how mathematical ideas are communicated and flow in classrooms. Topics include: discourse analysis; non-verbal communicative acts such as gesture and deixis; participation frameworks; and linguistic anthropology.
**MTE751 – Contemporary Issues in Elementary Grade Classrooms**
Students will study recent advances in the teaching and learning of mathematics to elementary and middle school students. Areas to be covered will typically include: development of children’s mathematical reasoning in K-8; current research in the development of children’s algebraic thinking; recent research on ratio, proportion and fractions learning; student and teacher understanding of geometry and measurement; technology use in elementary mathematics; teacher professional development; and school implementation and effecting policy.

**MTE752 – Research on Proof and Reasoning in Mathematics**
This course will critically examine the research base on proof and reasoning across grades K-16. It will explore epistemological issues of the nature of proof and the role and meaning of proof as it evolves across grades K-16 and as it has emerged historically. To support the ongoing development of critical reading and scholarly writing skills, the student will write a synthesis of the research base focusing on a specific aspect of proof and reasoning and will present their synthesis orally.

**MTE753 – Applied Research on Technology in Mathematics Education**
Students will examine recent and cutting-edge development in digital technologies relevant or applicable to the teaching and learning of mathematics. Students will be able to describe a broad range of digital technologies and the theories of mathematical learning underpinning their use, design and implementation. We will also focus on how the particular affordances of such technology aid mathematics education, overcome barriers such as normative teaching beliefs, social barriers, and diversity, and develop theories of democratizing access for all students.

**MTE754 – Semiotics and Symbolic Cognition**
This course focuses on the study of theories of the use and evolution of sign systems with particular reference to new and emerging symbolic systems across grades K-16 mathematics. Students will analyze popular and modern theories of semiotics and semiosis, and methods of semiotics to understand the use of signs and representational infrastructures in mathematics education with particular emphasis on reference, deixis, and interaction.

**MTE755 – Principles of Creativity & Innovation in Mathematics Education**
This course will consist of mini-projects focused on proof-of-concept development of educational initiatives in mathematics education, implementation and analysis. Concepts of design, fidelity, diffusion of innovation theory, dissemination strategies for scaling educational solutions, principles of commercialization and technology transfer will be addressed in the context of 21st Century adoption strategies and policy.

**MTE756 – Advanced Theoretical Development**
This course will examine specific, newly established literature as well as ongoing work in the particular field of students’ dissertation research projects. The purpose of the course is to enable students to gain deep conceptual control inside a particular area of research that will transform their knowledge and allow them
to display versatility and creativity in their own projects, going beyond adopting and adapting approaches developed by other researchers.

MTE769 – Advanced Topics in Mathematics Education
This course entails individual and/or group study under supervision of a mathematics education faculty member in an advanced area of mathematics education research that is not otherwise part of graduate course offerings.

MTE772-MTE773 – Dissertation Research (3 credits per course)
This course sequence focuses on conducting a full literature review, framing the main issues and guiding points of the student’s dissertation research, and collecting appropriate research data. It is expected that the student will also complete the preliminary writing phase of the dissertation in preparation for the proposal defense at the end of Year 3. The preliminary writing phase (essentially, the first several chapters of the dissertation) will focus on theoretical perspectives, relevant research framing the study, and preliminary data analysis from the student’s fieldwork.

MTE774-775 – Dissertation Research (9 credits per course)
This course sequence builds on MTE772-773 to complete analysis and writing for the final Dissertation.

III.E. Dissertation

The Ph.D. dissertation is an original body of work in which the candidate demonstrates an in-depth understanding of a substantive area in mathematics education. The dissertation demonstrates the candidate’s ability to effectively incorporate theoretical, conceptual, and methodological tools in a line of inquiry that produces a new, scholarly contribution to research in mathematics education.

While dissertation planning begins early in the Ph.D. Program, normally the dissertation process begins after the student has passed the qualifying examination and has been admitted to the Production Phase.

Dissertation Committee. The Ph.D. candidate selects a dissertation committee and chair. The candidate must submit the name of the dissertation committee chair to the Graduate Program Director and the Ph.D. Committee for review and approval upon completion of the qualifying examination. The candidate, in consultation with the dissertation committee chair, selects the committee members, elicits their willingness to serve, and submits their names to the Graduate Program Director and the Graduate Committee prior to completion of the first semester of coursework after completing the Qualifying Exam (Year 3, Semester 1). The committee must have a minimum of three (3) and no more than five (5) members. At least two (2) members should be Mathematics Education faculty in the STEM Department.
The dissertation committee chair is a University of Massachusetts Dartmouth Mathematics Education faculty who serves as the research mentor of the candidate and guides the candidate in research and funding processes and University protocols for research and scholarship. The dissertation committee chair has expertise in the area of the candidate’s research.

While many students’ dissertation research will be supervised by a member of the core Mathematics Education faculty, faculty from other departments or institutions can co-supervise dissertations alongside a member of the core Math Ed faculty (if approved by the Program Director in consultation with the Graduate Committee and the Dean of the School). In this case, the UMass Dartmouth Mathematics Education faculty would be the Primary (Lead) Dissertation Chair. The use of an adjunct supervisor can provide an authentic learning experience that converges lines of research and coursework to enrich the project and experience of the student.

The other members of the dissertation committee function as content or methods experts and assist the candidate in producing substantive research that makes a contribution to the field.

**Dissertation Proposal.** The research proposal defense is expected to be completed by the end of Year 3, that is, the first year following completion of the Qualifying Exam.

The candidate works closely with the chair of the dissertation committee to decide when to forward the draft proposal to the entire dissertation committee for review. After review, the candidate and the chair review the committee members' recommendations and make necessary adjustments to the proposal. The chair schedules a proposal defense. The final draft of the proposal must be received by all committee members three weeks prior to the scheduled defense. All members of the committee are expected read the proposal, forward any questions to the full committee and the candidate 72 hours in advance of the proposal defense, and attend the proposal defense.

Following the hearing, the committee meets in executive session and makes one of four determinations regarding the proposal: 1) approve; 2) approve subject to minor changes; 3) action deferred pending major revisions; and 4) disapprove. In the case of approval, the candidate may proceed with the dissertation.

In the case of approval with minor revisions, the candidate need only resubmit the revised proposal to the chair and any other specified committee members. Once approved, the chair forwards two (2) copies of the proposal to the Graduate Program Director with a letter stating that all minor revisions have been satisfactorily completed.

In the case of major revisions, the candidate must resubmit the proposal to all committee members. The candidate must complete both minor and major
revisions within three months. In the rare case of a rejection, the committee will meet with the candidate and decide how to proceed.

All dissertation work should follow the format of the *American Psychological Association Manual for Publication, 6th Ed.* and the relevant University guidelines in *Requirements for Theses and Dissertations* available at [http://www.umassd.edu/graduate/administration.cfm](http://www.umassd.edu/graduate/administration.cfm). Although the length of the proposal will vary with the candidate and the topic, the proposal must include the following elements:

a. cover page  
b. table of contents  
c. 300-400 word abstract  
d. introduction that clearly states the problem, establishes its significance, and states the research questions to be examined;  
e. critical review of the literature that synthesizes the current research on the problem, explores related bodies of knowledge that contribute to the understanding of the problem, and explores the theoretical framework of the study.  
f. thorough description of the methodology including research design, a description of the study population and sample, a plan to access the study population, human subjects considerations, data collection methods, and the plan for data analysis;  
g. work plan that identifies needed resources, indicates how they will be obtained, and presents a realistic time line for data collection and analysis;  
h. references;  
i. appendices with informed consent letters and instruments.

**The Dissertation.** The candidate works closely with the chair and other appropriate committee members throughout the data collection, data analysis and final writing phases of the dissertation. The candidate should expect repeated iterations of the dissertation to accommodate the committee chair’s and members’ input and guidance.

The dissertation contains all of the elements listed under Dissertation Proposal above. In addition, the methods section is revised to report the actual protocol for data collection and analysis. The following content areas are added to the dissertation manuscript:

a. Findings  
b. Identify new and/or confirmed knowledge  
c. Relate this new knowledge to the research question(s), theoretical framework and previous literature discussed earlier in the paper  
d. Identify limitations of the data/study  
e. Summarize the findings  
f. Discuss implications of these findings for mathematics education, specifically as these implications relate to the dissertation’s focus area  
g. Identify further research questions that arise in this study.
**Dissertation Defense.** The dissertation defense is scheduled by the committee chair after the committee members agree that the dissertation is sufficiently complete to undergo defense. Three weeks prior to the scheduled defense the final draft of the dissertation is delivered to all committee members. All members of the committee are expected to read the dissertation, forward any questions to the candidate and the committee at least 72 hours in advance of the scheduled dissertation defense and to attend the dissertation defense hearing.

Following the dissertation defense, the dissertation committee meets in executive session and makes one of two determinations: 1) approve; or 2) approve subject to minor changes. In the case of approval, the chair forwards 2 copies of the dissertation cover sheet to the Graduate Program Director and the candidate can prepare the dissertation for binding and microfilming.

In the case of approval with minor revisions, the candidate need only submit the revised dissertation to the chair and any other specified committee members. Once approved, the chair forwards two (2) copies of the dissertation cover sheet to the Graduate Program Director and the candidate can prepare the dissertation for binding and microfilming.

The dissertation manuscript must conform to *Requirements for Theses & Dissertations* at the University of Massachusetts Dartmouth; see [http://www.umassd.edu/graduate/administration.cfm](http://www.umassd.edu/graduate/administration.cfm). *Publication Manual of the American Psychological Association, 6th Ed.* is the required format for organization, tables, illustrations and references.

It is the student’s responsibility to pay particular attention to deadlines and the timing of the dissertation defense to allow enough time for a completed manuscript to be filed prior to Commencement exercises.

**Human Subjects.** All research and research-related activity proposed by any member of the UMD community that involves human subjects in any way must be reviewed by the university’s Institutional Review Board (IRB). This requirement is based upon the University’s assurance given to the federal Department of Health and Human Services that UMD researchers—faculty, students, administrators, staff—are aware of and follow all federal rules and regulations concerning the protection of human subjects in research as contained in the Code of Federal Regulations, Title 45, Part 46 (45 CFR 46). In addition, the Federal code requires that all researchers be trained and certified in the assessment of risk, informed consent, and research involving special populations such as children or prisoners.

Only after the dissertation proposal has been accepted by the committee may the student submit the required documents to the IRB. Data collection cannot start until appropriate Human Subjects approvals have been obtained. Forms and information about Human Subjects review can be obtained from the Office of Research.
III.F. Graduation Requirements

Successful completion of the program of study will be to complete all required coursework (including any additional required coursework identified as part of the student’s admission into the program) with a GPA of 3.0 or higher, complete the qualifying examination, defend a dissertation proposal to the satisfaction of the student’s dissertation committee, defend a final dissertation to the satisfaction of the student’s dissertation committee, and obtain approval of the dissertation for library submission.

IV. FINANCIAL SUPPORT AND ASSISTANTSHIPS

IV.A. Information Concerning Financial Aid

Students should consult with the Financial Aid Office regarding their eligibility for need-based assistance. Effort is made to secure financial support for students enrolled in the program.

See also the *Graduate Catalog* or the Office of Graduate Studies and Admission website [http://www.umassd.edu/graduate/administration.cfm](http://www.umassd.edu/graduate/administration.cfm) for more information. To qualify for any University assistantships, students must be in good academic standing, with a GPA of at least 3.0.

IV.B. Research and Teaching Assistantships

There are graduate research and teaching assistantships available for full-time students. Students are strongly encouraged to apply for these assistantships to develop critical research and teaching skills. The Kaput Center has a strong history of funded research to support research assistantships. Additionally, qualified students are eligible to serve as instructors in the STEM Department’s MAT program. For more information, see the Graduate Program Director.

V. ADMISSION REQUIREMENTS

V.A. Admission Criteria

Students are admitted to the Ph.D. program based on the analysis of a comprehensive set of measures used to determine their readiness for doctoral studies. While admission is into the doctoral program (not into a master’s level program), a Master of Science Degree will be awarded as a credential in the progression towards completion of the doctorate.
Prospective students will meet the following criteria for admission into the program:

a. Master’s degree (or equivalent) with a minimum GPA of 3.0 (or equivalent) from an accredited program in a field appropriate as preparatory work for doctoral studies in mathematics education. Students will be required to submit transcripts from all post-secondary institutions so that a determination can be made regarding the nature of preparatory course work and the student’s successful completion of it. Students who do not meet this requirement may be admitted conditionally, with the expectation that appropriate measures will be taken to address the requirements. Decisions will be made on a case-by-case basis.

b. A minimum overall GPA of 3.0 on all post-secondary education
c. Acceptable scores on the Graduate Record Examination.
d. Where applicable, a minimum TOEFL score of 500 (paper version) or 213 (computer version)

Criteria for admission are based on providing evidence of ability and motivation to succeed in a mathematics education research program, with potential to make a scholarly contribution to the field. As a field of research, mathematics education draws on an eclectic blend of disciplines. As such, the Ph.D. program is intentionally designed to be inclusive of applicants with diverse backgrounds of academic preparation in the technical and social sciences. It is anticipated that this diversity will enrich not only the overall experience of all doctoral students in the program, but the potential contribution students can make to mathematics education research.

This diversity notwithstanding, any perceived deficiencies in the applicant’s previous course work that should be addressed by additional pre-requisite preparation will be determined by the Graduate Program Director in consultation with the Graduate Committee and stated along with the official notification of admission. Students will be expected to meet any program deficiencies before qualifying for the Production Phase (Advanced Doctoral Phase).

V.B. Application to the Program

In addition to meeting the criteria for admission, applicants will be expected to submit the following as part of their application process:

- Completed UMass Dartmouth application form
- A letter of intent addressing two issues:
  i. Applicant’s qualifications and motivation for application to the program, including personal and career goals. This should discuss recent research and development experience and any publications, formal presentations, grants, or patents in which the applicant has been involved.
ii. An outline of potential research interests and potential connections to faculty work.

- Current resume
- Official transcripts of all post-secondary education
- Official scores on the Graduate Record Examination. Information about the test and about the locations of test centers is available from:
  
  Educational Testing Service
  Box 6000, Princeton
  New Jersey, 08541-6000
  tel. 609 771-7670 voice/TDD/text: 609-734-9362
  www.gre.org

- Three letters of recommendation from individuals familiar with the applicant’s academic ability and potential to conduct research at the doctoral level.

The application process can be completed online at http://www.umassd.edu/graduate/.

V.C. Application Review Process

The Graduate Program Director in consultation with the Graduate Committee will determine a recommendation for admission. The recommendation will then be reviewed by the Associate Provost for Graduate Studies, who confers official admission of all graduate students to UMass Dartmouth.

VI. ACADEMIC PROGRESS

VI.A. Academic Advising

Upon entering the program, each student is assigned a faculty member to serve as his or her Graduate Program Advisor. The role of the Graduate Program Advisor involves monitoring the student’s course of study and ensuring appropriate coursework and program benchmarks are completed. While the student’s Dissertation Committee Chair might also serve as his or her Graduate Program Advisor, these advising roles represent two distinct purposes.

VI.B. Academic Review

At the end of each semester, the Graduate Program Director and the Graduate Committee will review each student’s transcript and assess the adequacy of each student’s progress in achieving program objectives.
If a student is not performing to the program standards, the student will be placed on probation and the Graduate Committee will prescribe a course of action to be completed in order for the student to return to good standing in the program. The Graduate Program Director will inform the student in writing that s/he is not meeting program standards and will indicate what the committee prescribes as corrective action. A copy of this correspondence will be in the student’s file.

Appeal of a denied waiver may be made to the Graduate Committee.

**VI.C. Electives**

Students may take doctoral level courses at other universities with the approval of the Graduate Program Advisor and Graduate Program Director. The student must make the request in writing and submit a copy of the course syllabus. Only 6 credits from other universities may be applied to this program.

**VI.D. Full-time Status**

Full-time students are expected to take eighteen (18) credit hours per year. Full-time continuous students should complete all their course work four years of study.

Any student who wishes to register for more than the maximum credit load must secure written permission from the Graduate Program Advisor and Graduate Program Director.

**VI.E. Grades**

All students are required to receive a cumulative GPA of 3.0 or higher in order to remain in the program. A student who fails to earn the minimum GPA will be referred to the Graduate Committee. Failure to achieve the minimum GPA through re-taking the course or remedial work will result in dismissal from the program.

**VI.F. Incomplete**

A grade of “Incomplete” is not given automatically. A student must request a grade of “Incomplete” and receive approval from the instructor. The Ph.D. Program requires that the student and faculty member complete a written contract that specifies the incomplete work and an agreed upon time frame for completion. Both the student and the faculty member must sign the form and retain a copy. A third copy is filed with the Graduate Program Director.
In most cases, incomplete work from one semester should be finished before the start of the subsequent semester. Students with incomplete work in more than one course will not be allowed to enroll in additional courses until all incomplete work has been completed.

Students must complete course work identified in the program of study for Years 1 and 2 prior to the qualifying exam.

VI.G. Independent Study

Students may complete an independent study to fulfill required or elective credits. Independent study credits vary from 1 to 3 depending on the scope of the project. The independent study should consist of study and work at the doctoral level with a specified written product. The faculty member who agrees to work with the student in independent study must be a recognized expert in the content area. The student and faculty member must agree to the number of credits, scope of the work and the amount of supervision required (for example, weekly or biweekly meetings). A written agreement, signed by the student and the faculty member, must be approved by the Graduate Program Director, with copies retained by each.

VI.H. Leave of Absence

A student seeking a leave of absence (LOA) must petition the Graduate Program Director. An approved LOA extends the statue of limitations for degree completion by the length of the leave. The University requires that each matriculated graduate student must maintain continuous registration until the degree has been formally awarded. If the student does not register for courses or dissertation credits during any semester, the student must pay a fee per semester program fee to maintain continuous registration.

VI.I. Statute of Limitations

Students must make satisfactory progress toward completion of a degree within the Statute of Limitations for the degree. Each Ph.D. in Mathematics Education student must complete all degree requirements within four (4) calendar years for full-time students and six (6) calendar years for part-time or ABDs upon entering the program. Any requests for extensions will be reviewed by the Graduate Committee on a case-by-case basis. The Statute of Limitations will reflect the need for additional time for program completion by those students accepted into the program with additional provisions.

VI.J. Transfer Credit Policy

Students who have completed graduate course work at other accredited institutions may request to transfer those credits towards the completion of the Ph.D. at UMass Dartmouth. Up to the equivalent of twelve (12) credits from courses that meet the following requirements may be considered for transfer: 1)
the student received a grade of B or higher; 2) the courses have not been used to fulfill requirements for another degree; and 3) the course credit must have been earned no more than six (6) years prior to the student's matriculation. While up to 12 credit hours might be considered for transfer, the total number of credit hours that can be considered for transfer or waiver is not to exceed twelve (12) credit hours.

VI.K. Waiver Policy
A student may seek a waiver from a required course in the Program if he or she has completed a course with substantially equivalent content at another institution. A maximum of twelve (12) credit hours may be waived. While up to 12 credit hours might be considered for waiver, the total number of credit hours that can be considered for transfer or waiver is not to exceed twelve (12) credit hours.

Course waivers will be decided on a case-by-case basis, through negotiation between the student seeking the waiver and the faculty member who teaches the course. All waived courses require written approval of the faculty member, the Graduate Program Advisor and the Graduate Program Director. Waivers are completed in triplicate: one copy for the student, the faculty member, and one for the Graduate Program Director.

VII. COMMUNICATION WITH STUDENTS

Program information will be communicated to students by email and on-site mailboxes. Students will receive a UMassD e-mail account upon matriculation. This is the e-mail address that will be used to contact students with important information. Students keep their UMassD e-mail account for life.

Additionally, information about the program is available at [http://www.kaputcenter.umassd.edu/Ph.D/](http://www.kaputcenter.umassd.edu/Ph.D/)
VIII. REFERENCES

