Mining and Minerals Engineering Graduate Student Manual

Virginia Polytechnic Institute and State University

A supplement to the
Graduate Policies and Procedures and *Course Catalog*
published by the Graduate School

Revised April 2006

Rules and regulations in this document
apply to students beginning their graduate studies
in the Fall of 2006

Notice to Graduate Students

This document supplements the *Graduate Policies and Procedures and Course Catalog* (available from the Graduate School). Every graduate student should have his or her own copy of this document and should read it carefully. If the answer to a question cannot be obtained from the *Graduate Policies and Procedures and Course Catalog* or this manual, the answer should be sought by asking the major professor, the chairman of the mining and minerals engineering graduate committee (Dr. Mario Karfakis), the department head (Dr. Thomas Novak), or the Graduate School, preferably in that order. The intention of this manual is to provide graduate students information which will be helpful in their graduate studies. This document is not intended to be legally binding.

The policies and procedures contained in and referred to in this document are subject to the graduate student appeals process as described in the university's *Graduate Policies and Procedures and Course Catalog*.

Additional information on graduate study can be found on the Internet. The address of the university's homepage is http://www.vt.edu. Information about the Mining and Minerals Engineering Department can be found at its website: http://www.mining.vt.edu. General information on graduate study can be found at Virginia Tech's Graduate School website: http://www.grads.vt.edu.

Graduate Committee

Dr. M. Karfakis, Chairman
Dr. G. Adel, Member
Dr. E. Westman, Member

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General Information

The department offers the M.S., M. Eng., and Ph.D. degrees in mining and minerals engineering. The graduate program is designed to educate mining and minerals engineers for high-level challenges in research, development, and design and to prepare them for successful careers in industry, academia, and government.

The various areas offered provide specialization in particular phases of mining and minerals engineering. Graduate research may be pursued in the field of rock mechanics, ground control, equipment evaluation, systems analysis, health and safety, mineral processing, coal preparation, conservation, mining environment, mining ventilation, mine electrical systems, computer applications, and mineral economics. However, specific topics may be emphasized at times based on the activity of departmental research areas.

The graduate program in the Department of Mining and Minerals Engineering (MinE) is administered by the department head and a graduate committee. Student records and various approval forms are maintained by the department and are found at its website, http://www.mining.vt.edu/Academics/graduate. The MinE graduate committee is responsible for selecting students for admission, for overseeing the program curriculum, and for setting program standards. The department head appoints members of the graduate committee and approves all petitions to the Graduate School based upon the recommendations of the graduate committee. Current administrators are

Department Head	Tom Novak
Graduate Committee Chair	Mario Karfakis
Department Manager	Kathryn Dew Tel. (540) 231-6671 Email: dewk@vt.edu

Admissions

General Admissions Requirements

The Graduate Record Exam (GRE) is required for all foreign national applicants. In general, admitted candidates will have an aggregate score of 2000. The GRE is also recommended for U.S. applicants who do not have an undergraduate or master's degree from Virginia Tech.

In addition to the above admission requirements, international students whose first language is not English, or who do not hold a baccalaureate degree from an English language university, are also required to submit the results of the Test of English as a Foreign Language (TOEFL). A minimum score of 550 paper-based test/250 computer-

based test is required for consideration. In general, candidates admitted to the program will have a score of 600 or better paper-based/250 or better computer-based.

International students are required to undergo a process of certification of competence in English. International students who are native English speakers are exempt. Students who did not graduate from an English language university are required to take an English Placement Test administered by the Graduate School. This test must be taken at the beginning of a student's first semester of enrollment. Students who pass the test are certified as proficient. Students who demonstrate a need for remedial instruction will be required to enroll in a special English course immediately. Such study is counted as a regular part of a student's course load. Successful completion of the course constitutes certification.

International students currently enrolled for advanced degrees at other American universities are not usually admitted to the university until they have completed their degree requirements. International students will not be permitted to register for classes prior to the issuance of a Certificate of Eligibility (I-20AB or IAP-66) and the approval of the Immigration Service to attend Virginia Tech.

Types of Admission

Admission to graduate study at Virginia Tech is granted by the Graduate School after a recommendation of the mining and minerals engineering department head upon consultation with the departmental graduate committee. The deadline for applications is March 1. Applications received after the deadline will be considered on a case by case basis. Graduate applications received by the department will be evaluated and returned to the Graduate School within four weeks. The student may be admitted into one of the following categories:

Regular Graduate Student Status

A student with a cumulative quality credit average (QCA) of 3.0 or higher, and whose academic background is adequate and current may be admitted with regular status. An entering student must have demonstrated competence by the successful completion of a Bachelor's degree program in engineering or a related field from a recognized university. Students not having an adequate background in mining engineering will be expected to take make-up courses in areas of their deficiencies.

Provisional Graduate Student Status

For an applicant whose QCA is below the requirement and/or whose academic background is deficient or not current, provisional student status is allowed for no more than the equivalent of two semesters (12 credit hours of coursework is equivalent to one semester) during which time the provisional student must earn at least a 3.00 QCA. Provisional students are not eligible for financial assistance. Upon completion of no fewer than 12 credit hours of course work, the student's graduate advisory committee may recommend that the student be admitted to regular status. International students are not eligible for consideration for admission as provisional students.

Special Graduate Student Status

An applicant who does not qualify for admission in one of the above categories because of a deficient undergraduate academic record may be afforded an opportunity to demonstrate current ability to perform satisfactorily as a graduate student and to qualify for admission. This classification is available to applicants who have acquired some maturity and appropriate professional experience since completing their undergraduate degree. A graduate student with special status must take a minimum of 9 to 12 course credit hours with a QCA of 3.00 or better before reconsideration of admission status to "Provisional." These courses may be upper division undergraduate courses or graduate courses. None of these credits earned as a "Special Graduate Student" may be used toward a graduate degree. These courses only serve to qualify for admission to Graduate School. "Special Graduate Student" status is allowed for no more than the equivalent of two semesters. Students admitted in this status are not eligible for financial assistance.

Non-Degree Status

A student with a bachelor's or higher degree who fully qualifies for admission to Graduate School (on a regular or provisional basis) but who:

1. does not currently desire to work toward a graduate degree, or
2. desires to transfer the credits for use toward a graduate degree at another institution,

may be admitted with the non-degree status. Upon recommendation of the departmental graduate committee and the department head, subject to the approval of the Dean of the Graduate School, credits earned as a "non-degree" graduate student may subsequently be used toward meeting graduate degree requirements. "Non-degree" graduate students are not eligible for financial assistance.

Undergraduate Students

Undergraduate students may enroll in graduate courses with permission from the department head. Seniors who intend to receive a bachelor's degree, are within one semester of graduation, and have a QCA of 3.00 or better, may take graduate level coursework to satisfy an advanced degree program (M.Eng. or M.S.) as dual registrants.

Five-Year Bachelor / Master's Degree

Undergraduate students with a 3.5 or above QCA, and with the recommendation of the University Honors Program, may apply for admission to the Graduate School on the completion of seventy-five hours of undergraduate study. The College of Engineering and the department may impose additional requirements for admission to this program.

The student must append to the application to the Graduate School a letter from the department head affirming the department's acceptance of the student as a graduate student and their agreement that the student can complete his or her undergraduate studies upon demonstration of twelve hours of graduate study.

During the two semesters following admission to graduate school, the student may complete up to twelve hours of graduate work, jointly enrolled in the Graduate School and his/her undergraduate department. Successful completion of twelve hours of graduate work with no less than a "3.0" average will complete the last twelve hours of the undergraduate degree.

Internal Ph.D. Applications

Internal applicants (i.e., those persons who have completed the master's program in the Department of Mining and Minerals Engineering at Virginia Tech) should submit the following to the department manager:

- The Graduate School's Request for Change of Admission Status form
- A letter from the student's major professor supporting the application, endorsed by the members of the student's advisory committee, and
- An up-to-date transcript of the student's grades in the master's program at Virginia Tech.

The departmental graduate committee will evaluate the application and forward a recommendation to the department head. Students will be notified by the Graduate School of the department's action.

Financial Support

Graduate appointments with financial support are referred to as graduate assistantships. Graduate assistantships are generally provided for M.S. and Ph.D. candidates but not usually for M.Eng. students. A graduate assistantship also includes a tuition waiver. Upon accepting financial aid as a graduate assistant, a student normally is expected to perform assigned duties (a research project, teaching, grading for a professor, etc.) for a minimum period of one academic year. Students on an assistantship are required to work a minimum of 20 hours per week. Each student will be evaluated continuously by the faculty member supervising his or her work. If the student's work performance is not satisfactory, his or her financial support may be discontinued. In addition, the student must maintain a QCA of 3.00 or better in all courses taken as a graduate student irrespective of whether or not the courses are listed on the program of study. Financial support for summer school is handled on an individual basis. Financial support may be extended on a yearly basis, within the guidelines of the Graduate School, upon mutual agreement of the student, the project director, and the department head. There are four categories of graduate student appointments with financial support:

Graduate Assistant (GA): GAs are supported by university funds.

Graduate Teaching Assistant (GTA): GTAs are supported by university funds and help support the teaching activities of the department.

Graduate Research Assistant (GRA): GRAs are supported by funds from a faculty member's research program.

Graduate Project Assistant (GPA): GPAs are supported by funds from a faculty member's research program. They constitute a higher level of assistance than GRAs and are usually given to Ph.D. candidates.

The amount of each assistantship can vary with the extent to which the graduate student has completed degree requirements. Work periods for GAs and GTAs are normally based on the academic year (August 16 through May 15). Funding and work periods for GRAs and GPAs are normally based on a calendar year.

Degree Requirements

Student Responsibilities

All students are expected to be knowledgeable of and to comply with all university and departmental graduate regulations as stated in this document and official publications such as the *Graduate Policies and Procedures and Course Catalog*.

Advisor and Advisory Committee

Advisor

A student's advisor (major professor) provides guidance in selecting a program of study and in conducting the design or thesis/dissertation project required of each M.Eng., M.S., or Ph.D. candidate. Before registration for the second semester of study, each graduate student must confer with members of the faculty and obtain an agreement with one to serve as the student's advisor. The student is expected to take the initiative in selecting his or her major professor. The MinE department head will appoint a temporary advisor during the first semester of study for those students who have not made prior arrangements.

Advisory Committee Members

The function of the student's advisory committee is to approve the program of study, provide advice, and periodically assess progress. The M.S. or Ph.D. student and his or her advisor jointly select the other members of the advisory committee, and the student is responsible for obtaining from those chosen their agreement to serve. An advisory committee should be selected during the first semester of study.

The advisory committee for an M.S. candidate consists of a minimum of three faculty members, with not less than two from the Department of Mining and Minerals Engineering.

The advisory committee for a Ph.D. candidate consists of a minimum of five faculty members, with not less than three from the Department of Mining & Minerals Engineering and not less than one from outside the department.

Advisory committee members should hold an academic degree at least equivalent to the degree being sought by the student. A committee member who does not satisfy this qualification but has substantial and significant expertise in the research topic of the student may be invited to serve on an advisory committee; however, approval by the Graduate School must be sought in such cases. It is the department's expectation that all members serving on an advisory committee actively participate in advising the student and in directing the research program.

An M.Eng. candidate usually has only one advisor during his or her period of study. The final examination is administered by an examining committee appointed by the department head.

The M.S. or Ph.D. student and his or her advisor are responsible for arranging meetings of the advisory committee at appropriate times. It is strongly recommended that advisory committees meet when the student is starting his or her research to discuss the undertaking and again when the student and the advisor feel that the research has been completed and the student is ready to begin writing the thesis. Each student should arrange a meeting with his or her advisory committee at least once per semester. The graduate seminar given by the students may serve this purpose, and therefore, should be attended by all members of the advisory committee. Each student should meet with his or her major professor at least once per month to discuss the status of his or her graduate program; failure to meet with the major professor during the semester may result in receiving no credit for thesis or dissertation hours.

Program of Study

All graduate students must submit an approved Program of Study (Appendix B). The program must meet the minimum requirements for the particular degree being sought and must be approved by the student's advisory committee, the chair of the graduate committee, the department head, and the Graduate School. For Master's students, the program should be submitted before completing 12 credit hours of study at Virginia Tech; for Ph.D. students, the program of study should be submitted before completing 20 credit hours beyond the baccalaureate degree or 12 hours beyond the masters.

Requesting a Program of Study

Students must obtain a MinE Program of Study Form from the department website at www.mining.vt.edu/Academics/graduate, fill it out after consulting with his or her advisor and advisory committee, obtain the signatures of the advisor and advisory committee members, and submit it to the MinE graduate program chair who will check that the degree requirements are satisfied. Upon approval from the department head, the program will be submitted to the Graduate School for final approval.

Changes to Program of Study

A change in the program of study is necessary whenever the student's course of study deviates from the original program approved by the advisory committee. *Plan of Study Change* forms are available at the Graduate School at

http://www.grads.vt.edu/forms/academics/Chg_Plan.pdf. A change in the program of study is also required to change members of the student's advisory committee. The *Change of Committee* form is available at http://www.grads.vt.edu/forms/academics/Chg_Committee.pdf.

Courses

In order to enroll in graduate courses in mining and minerals engineering, students must demonstrate proficiency at the undergraduate level either by holding an undergraduate degree in mining and minerals engineering, by examination, or by taking selected undergraduate courses. General course requirements for M.Eng., M.S., and Ph.D. degrees are given in Table I. The departmental graduate courses and the 4000-level courses approved for graduate credit are described in the *Course Catalog*.

Graduate Seminar

All graduate students must register for Graduate Seminar for each Fall and Spring Semester in which they are enrolled. In addition, each graduate student in the department is required to present a seminar on his or her topic of research in order to satisfy the seminar enrollment requirement (see Table I). All advisory committee members should be present during the seminar of their advisee. All graduate students, both part-time and full-time, are required to attend the seminar during each semester in residence on the campus.

Transfer of Credits

Graduate courses taken at other institutions can be included in the Program of Study under the conditions described in the *Graduate Policies and Procedures and Course Catalog*. To facilitate the approval process, students should attach a statement containing the syllabus and description of the courses they wish to transfer, the name of the textbooks used (copies of textbooks if possible), and the numbers and catalog descriptions of the Virginia Tech courses which most nearly match the courses they wish to transfer.

Time Limits

- Coursework more than five years old at the time of submission of the plan of study must be revalidated to count toward the Master's or Ph.D. degree.
- Coursework on the plan of study must be completed within five years after approval of the plan of study or revalidated to count towards the Master's degree.
- Coursework on the plan of study must be completed within seven years after approval of the plan of study or revalidated in the preliminary examination for the Ph.D. has not been completed by then.

Table I – Course Requirements for MinE Graduate Degrees

Master's of Engineering		
Courses	**Semester Credit Hours**	
	Minimum	**Maximum**
4000 level[a]	--	12
5000 level or higher[b]	15	--
5944 Seminar[c]	1	2
Special and Independent Study[d] (5974 and 5984)	--	6
Project and Report (5904)	3	6
Total	30	--
Master's of Science		
Courses	**Semester Credit Hours**	
	Minimum	**Maximum**
4000 level[a]	--	12
5000 level or higher[b]	12	--
5944 Seminar[c]	1	2
Special and Independent Study[d] (5974 and 5984)	--	5
Research and Thesis (5994) [e]	6	10
Total	30	--
Ph.D.		
Courses	**Semester Credit Hours**	
	Minimum	**Maximum**
4000 level[a]	--	6
5000 level or higher[b]	27	--
5944 Seminar[c]	2	4
Special and Independent Study[d] (5974, 5984, and 6984)	--	9
Research and Dissertation (5994)[e]	30	60
Total	90	--

[a] The 12 credit hour maximum applies to 4000 level courses approved for graduate credit: 4000 level courses not approved for graduate credit cannot be counted toward graduation requirements. A maximum of 6 credit hours may be in 4000 level courses not approved for graduate credit if outside the student's major field and if judged by the student's committee to be on a level warranting graduate credit. Any number of 4000 level courses approved for graduate credit may be counted toward 90 hour total.

[b] Courses numbered 5000 or above may not be taken on a pass/fail basis except when offered P/F only.

[c] An additional seminar aside from the MinE 5944 seminar may be taken on a P/F basis and may be used toward the minimum requirements in courses numbered 5000 or higher.

[d] Additional hours of 5974 and 5984 may be taken, but cannot be credited toward the minimum hours for the degree. All courses should be listed on the Program of Study by title, not "Special/Independent" study. Undergraduate Independent Study (4974) may not be used to satisfy minimum degree requirements. 5974 and 5984 may be used in meeting minimum requirements for courses numbered 5000 or higher. All courses should be listed on the Program of Study by title, not "special/independent" study. For the Master's Degree, no more than 6 hours for each and no more than 9 hours for both combined. For the Doctoral degree, no more than 12 hours for each and no more than 18 hours for both combined.

[e] Maximum 10 hours of 5994

Academic Eligibility

The university requires that candidates for graduate degrees maintain a 3.00 quality credit average (QCA) computed over all courses taken at the university. In addition, the MinE department requires that students maintain a 3.00 average for all courses numbered 4000 and above. A student who fails to maintain a 3.00 will be placed on departmental probation. Students must raise their average above 3.00 during the next academic semester to be removed from probation. Failure to regain regular status is grounds for dismissal. Failure to maintain a 2.0 average during any single semester is also grounds for dismissal. Transfer courses are not used in the computation of university or departmental QCA.

Registration

Registration for classes can occur up to the deadline specified on the university calendar. Pre-registration is strongly encouraged during the preceding semester since the MinE department generally cancels under-enrolled courses based upon pre-registration numbers.

All graduate students who are supported by GRA, GPA, GTA or GA, whether continuing or new, are required to register for a minimum of 12 credits per semester, if working toward a degree which requires either a thesis or dissertation. The required credits may consist of any combination of course credits and variable credit course (5904, 5974, 5984, 5994, or 7994) credits.

Project Report, Thesis, and Dissertation

Project Report: (M. Eng)

A report on an engineering project undertaken by the student must be prepared and submitted to the Graduate School. Editorial standards and graduate school requirements are the same as those for theses. The report must be approved by the student's advisor and the examining committee set up by the department head at the request of the major professor. Copies of the project report must be submitted to members of the examining committee at least one week before the scheduled time of the final examination.

Thesis and Dissertation (M.S./Ph.D.)

The Department of Mining and Minerals Engineering requires submission of a thesis (MS) or a dissertation (Ph.D) which consists of a written report of the student's research. (In this manual, the term *thesis* may refer to either a *thesis* or *dissertation* unless noted otherwise.) Requirements for thesis preparation are specified in the Graduate School's *Policies and Procedures*. The candidate must deliver one final copy of the thesis to each member of the examining committee at least two weeks before the date of the final examination.

Examination Procedures

M.S. and M.Eng. Final Examinations

Each M.S. candidate will take an oral final examination which will cover not only the thesis but also the student's general preparation in mining and minerals engineering. The following procedure is to be used:

- The final examination must be scheduled through the Graduate School. The Graduate School requires a minimum of two weeks advance notice to schedule theses examinations. Final examination forms are available at the Gradate School at http://www.grads.vt.edu/forms/academics/Sched_Final.pdf.
- At the final examination, the candidate will be asked to make a short presentation to the examining committee, describing the important aspects and results of the research. About the first half of the examination will be devoted to examining the thesis. The second half of the examination will be more general in nature, and draw from the student's background, including coursework. To aid the faculty in preparing for this part of the examination, it is recommended that the candidate furnish each member of the examining committee with a list of the courses taken (or a copy of the program of study).
- The M.Eng. candidate will take a final oral examination similar to that taken by an M.S. candidate, except that the first part of the examination will center on the Project and Report instead of a thesis.
- The candidate's presentation is open to all members of Virginia Tech's academic community. However, after the completion of the presentation, attendance by individuals who are not faculty members of professorial rank must have approval of the examining committee. Candidates will be questioned by members of the examining committee and by those faculty members who are invited to participate. The examining committee consists of the members of the student's advisory committee (in the case of the M.S.), although it is not necessarily so restricted. On the basis of the candidate's performance in the examination, the examining committee will determine whether the student has passed or failed.
- A majority vote of the examining committee is required for a pass. In this event, the committee may, at its discretion, require minor thesis revisions and/or inform the candidate of areas of weakness revealed by the examination. If the advisory committee decides that the candidate has failed the examination, the committee shall determine:
    - If the candidate may re-take the examination,
    - When the examination may be repeated (normally the following semester), and
    - If necessary, project/thesis revisions, and additional research and/or course work.

Ph.D. Qualifying Examination

This examination is used to evaluate the student's mastery of the subject of mining and minerals engineering, to determine deficiencies, and to formulate judgments on whether the student should be encouraged to pursue doctoral studies. The examination must be passed by all Ph.D. candidates and may be taken by M.S. candidates who intend to apply to the Ph.D. program.

It is important for the Ph.D. student to bring together the knowledge acquired in graduate and undergraduate courses, rather than to view each course as a separate, unrelated requirement to pass. Thus, it is the student's responsibility to conduct an individual comprehensive review of subject matter relevant to mining and minerals engineering.

Eligibility Requirements. To take the MinE qualifying examination the student and the student's advisor must verify in writing to the MinE graduate committee that the following conditions have been met:

- The student has a properly formulated committee and an approved program of study.
- The student has completed at least one and one-half years of study beyond the B.S. degree. This requirement may be waived subject to approval by the student's advisory committee and by the departmental graduate committee.

These conditions are verified when the student provides a copy of the approved Graduate Plan of Study to the graduate committee chairman three weeks prior to the examination. The student's advisor is responsible for checking the student's eligibility.

When to Take the Examination. The candidate must take the examination by the end of his or her first year of Ph.D. studies. A student who has completed all of the M.S. level graduate work in the MinE Department must take this examination no later than the first opportunity before completing 42 graduate credits.

Administration of the Examination. The Ph.D. qualifying examination is conducted jointly by the MinE faculty and the MinE graduate committee. The examination is given once a year in April. The exact dates of the examination will be sent to each MinE graduate student by the graduate committee chairman early in the Fall Semester. At this time the student, with the assistance of the advisor, will select four areas to be tested on (Appendix C) and notify the graduate chair in writing on the selection.

Examination Format and Procedures Used to Evaluate Performance. The open-book written qualifying examination will cover four areas of the student's choice and will be given in two four-hour sessions: one session each on two consecutive days. For each area, the student will have to answer three out of four given questions during a two hour open–book exam.

The faculty will meet as a whole to decide the minimum grade for passing the examination. The possible outcome of each exam is pass, conditional pass, or fail. Students who conditionally pass are required to make up their deficiencies by enrolling in courses identified by their advisory committee. Students who fail are permitted one chance to retake the exam the following semester. If they do not pass this second attempt, they will not be allowed to continue with their doctoral studies.

Ph.D. Preliminary Examination

The preliminary examination is a requirement for all doctoral students. This examination must be taken **at least nine months before the final examination**. At least 24 hours of course work and/or research must remain to be taken, including work for which the student is currently enrolled.

For the preliminary examination, the candidate is required to write and orally present a detailed proposal for his/her dissertation research. This requirement must be completed within one year after passing the qualifying examination and at least nine months prior to the Ph.D. Final Examination.

The research proposal must be completed and distributed to the advisory committee members at least two weeks in advance of the oral presentation. Since the purpose of the preliminary examination is to determine if the student is prepared to undertake the proposed research, the majority of questioning will focus on the material contained in the proposal although the format of the examination can be modified at the discretion of the major advisor.

The preliminary examination must be scheduled through the Graduate School. The Graduate School requires a minimum of two weeks advance notice to schedule these examinations. Preliminary examination forms are available at the Graduate School at http://www.grads.vt.edu/forms/academics/Sched_Prelim.pdf.

At the same time the student schedules the preliminary examination with the Graduate School, the student should deliver to the MinE department manager a copy of the scheduling request, a short abstract of the student's proposed research, and a short biography. This information will be used to prepare a preliminary examination announcement, which will be distributed to the departmental faculty.

The advisory committee determines if a student passes or fails the preliminary examination. The resulting outcome can be pass, conditional pass, or fail. Two negative votes are required for a fail decision. If a student fails, he/she is permitted a second attempt, which must occur during the following semester.

The conditions on the conditional pass are decided by the advisory committee, and a written record of the conditions must be included in the student file. Certification of completing the conditions must be made prior to scheduling the final oral examination.

This exam is announced in advance, and all professorial rank faculty members are invited to attend. In addition, it is the option of the major professor and advisory

committee to invite graduate students or others to attend a portion or all of the preliminary examination; however, approval by the Graduate School must be sought in all such cases. Examinations may only be scheduled during regular academic sessions.

Ph.D. Final Examination

The final examination must be scheduled through the Graduate School. The Graduate School requires a minimum of two weeks advance notice to schedule theses examinations. Final examination forms are available at the Gradate School at http://www.grads.vt.edu/forms/academics/Sched_Final.pdf.

The final examination for Ph.D candidates is centered on the defense of the dissertation. This exam is advertised in advance. The candidate's presentation is open to all members of Virginia Tech's academic community. However, after the completion of the presentation, attendance by others, except faculty members of professorial rank, must be approved by the examining committee. Examinations may only be scheduled during regular academic sessions.

On the basis of the final examination, the quality of the dissertation, and the candidate's overall academic record, the examining committee will make a recommendation as to the acceptance of the dissertation and the awarding of the Ph.D. degree.

The committee shall either pass or fail the candidate. A pass requires a majority of approval votes from the committee members. In the event of a passing decision, the committee shall indicate any minor revisions which may be required in the dissertation. In the event of a failure, the committee shall recommend:

- If and when another examination shall be permitted (normally the following semester), and
- Additional research and major revisions of the dissertation.

The student is allowed no more than two opportunities to pass the final examination.

Progress Towards Degree

The following tables indicate typical times required to reach important benchmarks of the three graduate degrees.

Table II.—M.Eng. Degree Benchmarks

Time Since Admission	Progress
0-6 months	Select thesis advisor, advisory committee
0-12 months	Submit Program of Study
12-18 months	Submit Project Report

Table III.—M.S. Degree Benchmarks

Time Since Admission	Progress
0-6 months	Select thesis advisor, advisory committee
0-12 months	Submit Program of Study
12-24 months	Defend thesis

Table IV.—Ph.D. Degree Benchmarks

Time Since Admission	Progress
0-6 months	Select thesis advisor, advisory committee
0-6 months	Submit Program of Study
0-12 months	Pass Qualifying Exam
12-24 months	Pass Preliminary Exam
36-48 months	Defend dissertation

Graduate Student Performance Evaluation

Every year at the beginning of April, the student should ask his or her advisor to complete the Graduate Student Progress Evaluation Form (Appendix D), which is available at http://www.mining.vt.edu/Academics/graduate.html. The student should be given the opportunity to read, review and respond to the advisor's evaluations. Negative reviews should be fully documented. In the case of an irreconcilable disagreement between the student and the advisor, the matter should be resolved by the Department Graduate Committee.

Administrative Forms

The following forms are important at various stages of the graduate student's tenure:

- **MinE Graduate Program of Study Form**. This form identifies the student's graduate advisory committee and lists the courses the student has taken, or plans to take, to fulfill the requirements for his or her particular degree. It should be obtained at http://www.mining.vt.edu/Academics/graduate, filled out by the student, signed by the student's advisory committee, and returned to the department manager. A copy will be made for the student's file, and the original will be forwarded to the graduate school.
- **Independent Study Request Form**. This approval form is required to enroll in an independent study course. The form is available from the Mining & Minerals Engineering department website at http://www.mining.vt.edu/Academics/graduate.
- **Request for Leave of Absence**. This form is used when studies are interrupted for a semester or more. The form is available from the Graduate School website, http://www.grads.vt.edu/forms/academics/Req_Lv_of_Absence.pdf.
- **Plan of Study Change Form**. This form is used to make course changes on a student's Plan of Study. The form is available from the Graduate School, http://www.grads.vt.edu/forms/academics/Chg_Plan.pdf.
- **Change of Committee/Advisor Form**. This form is used to change advisors or committee members on a student's Program of. The form is available from the Graduate School, http://www.grads.vt.edu/forms/academics/Chg_Committee.pdf.
- **Request to Admit Candidate to Preliminary Examination**. This form is used to obtain a committee signature card for the exam, and it is used by Ph.D. candidates to notify the graduate school of the place and time of a student's preliminary exam. The form is available from the Graduate School, http://www.grads.vt.edu/forms/academics/Sched_Prelim.pdf.
- **Certification of Defending Student Status**. This form is used to avoid paying a semester of tuition when the thesis defense will be completed no later than 20 days after the first day of class. The form is available from the Graduate School, http://www.grads.vt.edu/forms/academics/Cert_of_Defending_Status.pdf.
- **Request to Admit Candidate to the Final Examination**. This form is used by M.Eng., M.S., and Ph.D. candidates to notify the graduate school of the place and time of a student's final examination and to obtain a committee signature card for the exam. The form is available from the Graduate School website, http://www.grads.vt.edu/forms/academics/Sched_Final.pdf.

Additional forms dealing with tuition, fees, graduation and other important graduate student concerns can also be obtained at the Graduate School website, http://www.grads.vt.edu/forms/index.html.

Faculty

The following table shows the Mining & Minerals Engineering department faculty, their years appointed, and degrees.

Table V—Mining & Minerals Engineering Faculty

Faculty Member	Year Appointed	Degrees and Schools Attended
Adel, Gregory T *Professor, Assistant Head* adel@vt.edu	1982	B.S., South Dakota School of Mines and Technology, 1978 M.S., South Dakota School of Mines and Technology, 1979 D. Eng., California, Berkeley, 1982
Karfakis, Mario G. *Associate Professor* mario@vt.edu	1988	B.S., Université Scientifique et Médical de Grenoble, Institut Dolomieu, France, 1975 M.S., University of Wisconsin, Madison, 1978 Ph.D., University of Wisconsin, Madison, 1983
Karmis, Michael E. *Stonie Barker Professor* mkarmis@vt.edu	1978	B.S., Strathclyde, 1971 Ph.D., Strathclyde, 1974
Luttrell, Gerald H. *Massey Professor* luttrell@vt.edu	1986	B.S., VPI & SU, 1980 M.S., VPI & SU, 1982 Ph.D., VPI & SU, 1986
Nieto, Antonio *Assistant Professor* anieto@vt.edu	2002	B.S., Guanajuato School of Mines, 1990 M.S., Colorado School of Mines, 1995 M. Eng., Ecole des Mines de Paris, 1997 Ph.D., Colorado School of Mines, 2002
Novak, Thomas *Charles T. Holland Professor and Head* tomnovak@vt.edu	2001	B.S., Penn State University, 1975 M.S., University of Pittsburgh, 1978 Ph.D., Penn State University, 1984
Westman, Erik *Assistant Professor* ewestman@vt.edu	1999	B.S., Colorado School of Mines, 1986 M.S., University of Colorado, 1994 Ph.D., VPI & SU, 1999
Yoon, Roe-Hoan *Nicholas T. Camicia Professor* ryoon@vt.edu	1978	B.S., Seoul National University, 1967 M.S., McGill University, 1971 Ph.D., McGill University, 1977

Faculty Areas of Expertise

The following table shows the Mining & Minerals Engineering department faculty areas of expertise.

Table VI—Faculty Areas of Expertise

Faculty Member	Area of Expertise
Adel, Gregory T.	Modeling and simulation of mineral processing/coal preparation operations; process control and sensor development for mineral processing/coal preparation plants; optical and video-based sensing technology; image analysis characterization of minerals, coal, soils, and waste; liberation analysis and complex particle behavior in grinding and flotation circuits; fundamentals of comminution.
Karfakis, Mario G.	Geomechanics; rock fracture mechanics; rock fragmentation; characterization of geomaterials; ground control; environmental impact of excavation and construction in rock; abandoned coal mine problem mitigation; design and operation of surface mining systems.
Karmis, Michael E.	Rock mechanics and ground control; design of surface and underground mining excavations; mining systems engineering; surface subsidence due to underground mining; engineering and environmental aspects of mineral resources development.
Luttrell, Gerald H.	Process engineering, including simulation and modeling, process control, and circuit analysis; coal preparation, including equipment design, advanced coal cleaning, and column flotation; mineral processing, including fine particle processing, flotation hydrodynamics, flotation cell/column design; environmental remediation, including soil treatment and volume reduction of radioactive soils.
Nieto, Antonio	Ore reserve estimation by geostatistical characterization; open pit limit design (moving cone and Lerches Grossman algorithms); mining economic evaluation; cutoff grade optimization for multiple ore types; open pit mine production scheduling optimization; geostatistical characterization of contaminated soils for environmental remediation; underground mine design; application of GPS, virtual reality and wireless networks for mining applications including: vehicle proximity warning and real-time mine planning.
Novak, Thomas	Mine electrical systems and equipment, including safety, system design, computer modeling, and grounding; mine ventilation and coalbed methane, including safety, system design, and computer modeling.
Westman, Erik	Geomechanics; geophysical methods; numerical modeling of rock behavior; reserve estimation; mine design software; geographic information systems; monitoring systems
Yoon, Roe-Hoan	Mineral processing, coal preparation, surface chemistry, colloid chemistry, and electrochemistry, centering on the separation of fine particulate materials; development of new separation methods by control of surface chemistry and hydrodynamics; hydrophobic interactions, direct surface force measurement, coagulation and dispersion; dewatering of fine particles; triboelectrostatic separation; recycling of secondary material.

Appendix A
Graduate Honor Code

The Graduate Honor Code establishes a standard of academic integrity. As such, this code demands a firm adherence to a set of values. In particular, the code is founded on the concept of honesty with respect to the intellectual efforts of oneself and others. Compliance with the Graduate Honor Code requires that all graduate students exercise honesty and ethical behavior in all their academic pursuits here at Virginia Tech, whether these undertakings pertain to study, coursework, research, extension, or teaching.

It is recognized that graduate students have very diverse cultural backgrounds. In light of this, the term ethical behavior is defined as conforming to accepted professional standards of conduct, such as codes of ethics used by professional societies in the United States to regulate the manner in which their professions are practiced. The knowledge and practice of ethical behavior shall be the full responsibility of the student. Graduate students may, however, consult with their major professors, department heads, the International Students Office, or the Graduate School for further information on what is expected of them.

More specifically, all graduate students, while being affiliated with Virginia Tech, shall abide by the standards established by Virginia Tech. Graduate students, in accepting admission, indicate their willingness to subscribe to and be governed by the Graduate Honor Code and acknowledge the right of the university to establish policies and procedures and to take disciplinary action (including suspension or expulsion) when such action is warranted. Ignorance shall be no excuse for actions which violate the integrity of the academic community.

The fundamental beliefs underlying and reflected in the Graduate Honor Code are that (1) to trust in a person is a positive force in making a person worthy of trust, (2) to study, perform research, and teach in an environment that is free from the inconveniences and injustices caused by any form of intellectual dishonesty is a right of every graduate student, and (3) to live by an Honor System, which places a positive emphasis on honesty as a means of protecting this right, is consistent with, and a contribution to, the university's quest for truth.

Appendix B
MinE Graduate Program of Study Form

Department of Mining & Minerals Engineering
Graduate Program of Study

Name: _____

ID#: _____

Advisor: _____

Graduate Plan of Study for:

- ☐ **Masters of Engineering**
- ☐ **Masters of Science**
- ☐ **Doctor of Philosophy**

Expected Date of Graduation: _____

Research Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

5000 Level Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

4000 Level Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

Supporting Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

Transferred Research Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

Transferred 5000 Level Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

Transferred 4000 Level Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

Transferred Supporting Courses

Year	Term	Subject	Course #	Credit Hours	Course Name

Committee Members

M.S., M.Eng. – Minimum 3 Committee Members

Ph.D. – Minimum 5 Committee Members, with not less than three from the Department of Mining & Minerals Engineering and not less than 1 from outside the department.

ID Number	Name	Signature	Type of Committee Member
			Department Head
			Chairman
			Committee Member
			Committee Member
			Committee Member
			Committee Member (Outside Department)

Appendix C
PhD Qualifying Exam Subject Areas

The student will be tested in four areas of his of her choice from the list below. For each area, the student will have to answer three out of four given questions during a two hour open–book exam.

- Exploration and Mine Economics
- Surface Mining Methods
- Underground Mining Methods
- Surface Ground Control
- Underground Ground Control
- Blasting
- Power Systems
- Conveyors
- Trucks and Haul Roads
- Pumping Systems
- Mine Ventilation
- Communition
- Surface chemistry
- Physical separation
- Dewatering
- Process engineering
- Mine Reclamation
- Health and Safety

Appendix D
Annual Graduate Student Progress Evaluation

To be Completed by August 15, _____

Graduate Student _____
(last name) (first name)

Student ID # _____

Faculty Advisor _____

Date enrolled in the program _____

Academic performance (circle one)

Outstanding (3.75 to 4.) **Good (3.25 to 3.70)** **Satisfactory (3.00 to 3.20)** **Unsatisfactory (below 3.00)**

Plan of Study approved by Graduate School (circle one) **Yes** **No**
If no, anticipated submittal date _____

Assistantship status _____

Courses taken and grade since last evaluation period

Course name and Number	**Grade**

Performance and progress of research for M.S. or Ph.D. (circle one)

Outstanding **Good** **Satisfactory** **Unsatisfactory**

Student and faculty have regular scheduled meeting at least (circle one)

Once per week **Once per month** **Once per semester** **Once per year**

Overall performance of the student

Outstanding **Good** **Satisfactory** **Unsatisfactory**

Anticipated completion date of degree: _____

To be completed for Ph.D. Students
Qualifying Examination taken as required (circle one) **Yes** **No**
If no, anticipated date of Exam _____

Preliminary Examination taken as required (circle one) **Yes** **No**
If no, anticipated date of Exam _____

Comments on overall performance and recommendation for the next review period
(to be completed by faculty advisor)

Date of Evaluation _____

Faculty Advisors' Signature **Students' Signature**